TECHNOLOGY DEPT.

Gas Journal

VOL. 289. 109th YEAR. LONDON, JANUARY 30, 1957. No. 4881 PRICE 1/6

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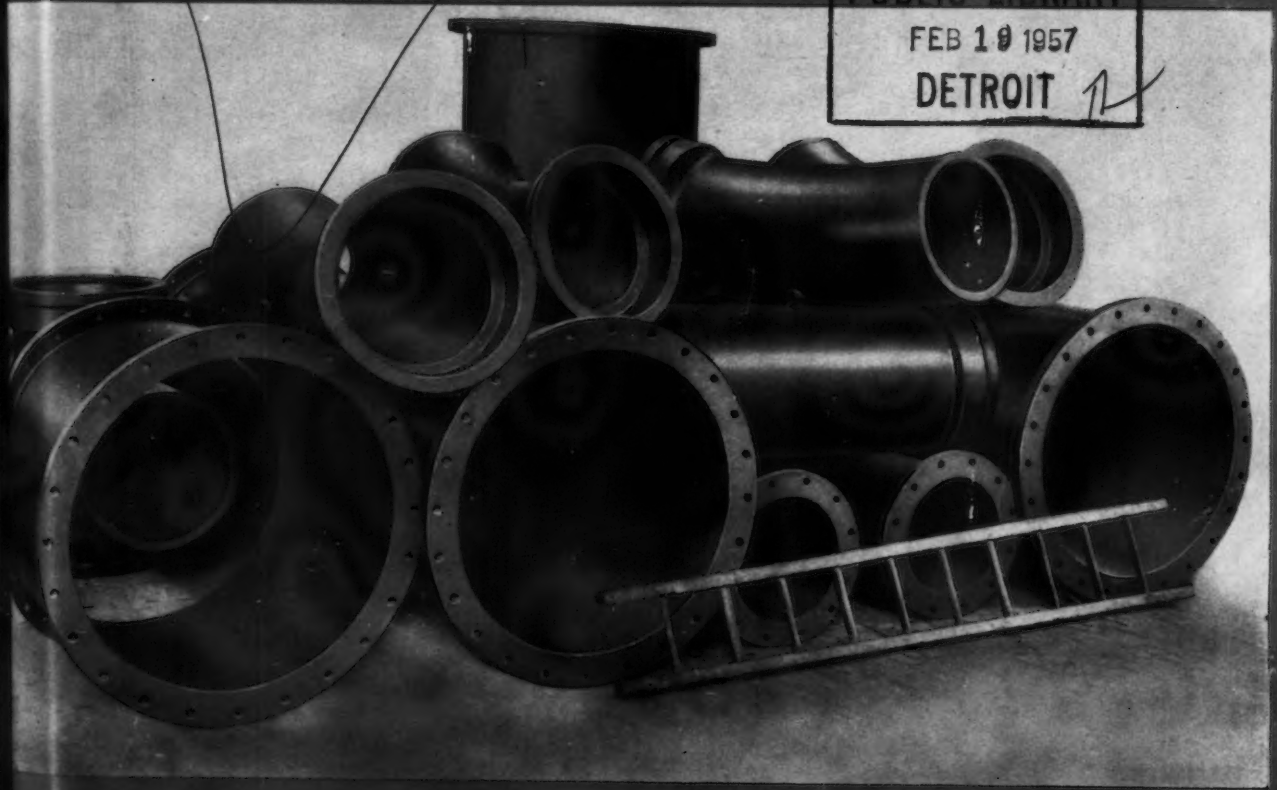

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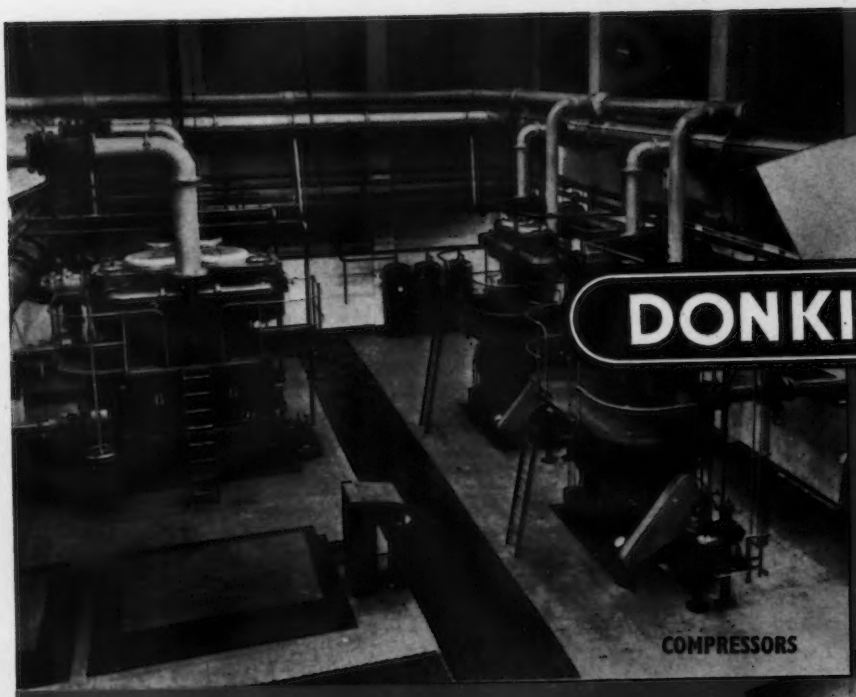
CAST IRON SPECIAL PIPES

Please send us your enquiries



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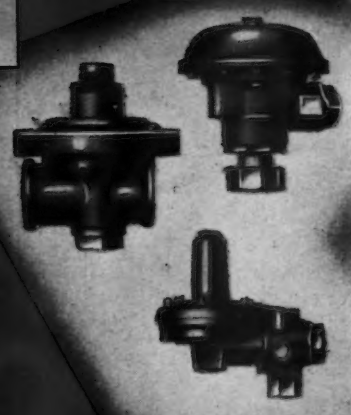
VALVES

Serving Industry

Millions of cubic feet of gas are used daily in factories and homes throughout the country.

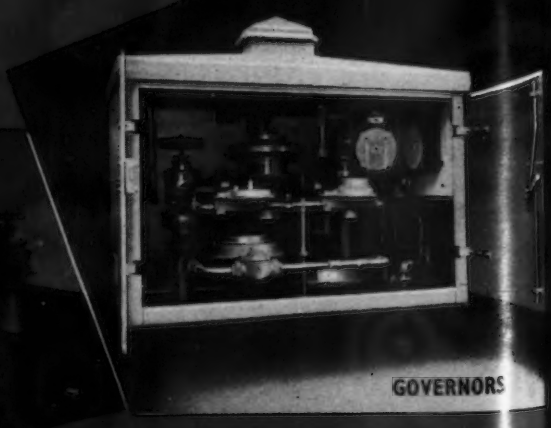
The comprehensive nature of DONKIN equipment is such as to cover every phase of gas distribution and control.

Over 150 years experience, sound engineering practice and design together with first class workmanship have proved the reliability of DONKIN products which are well known in many parts of the world.



REGULATORS

BOOSTERS



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THE BRYAN DONKIN Co. LTD. CHESTERFIELD

BY-PRODUCT PLANT

WELDED STEEL BENZOLE SCRUBBERS AND COOLER

supplied to the order of Woodall-Duckham Construction Company Ltd. at the Stanton Ironworks

AMMONIA CONCENTRATION

We also design and make plant for:—(a) a concentrated gas liquor product, and (b) a pure ammonia product.

The compact design of these plants is based on our long established tradition in this field and sound technical approach; special attention being paid to low steam consumption, automatic control, and general ease of maintenance.

Your enquiries and orders will be welcomed by :

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GAS PLANT WORKS · NEWTON HEATH

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We make:—BY-PRODUCT and CHEMICAL PLANT · CONDENSERS · DETARRERS · GAS CONNECTIONS and VALVES. GASHOLDERS · IRON CASTINGS · PURIFIERS · STILLS · TANKS · WASHERS · WELDED and RIVETED STEEL WORK

MANOX OXIDE
FOR THE GAS INDUSTRY
The material offered is our own manufacture, and is of the following composition:—
Moisture ... ... 38% (loss on heating at 212 F)
63%-65% (Total iron calculated as $Fe_2O_3.3H_2O$ on the dry basis.)
Ferric Hydrate
The following allowances will be made in the case of any deviation from the above specification:—
For each complete 1% Moisture in excess of 38%
6d. per ton allowance.
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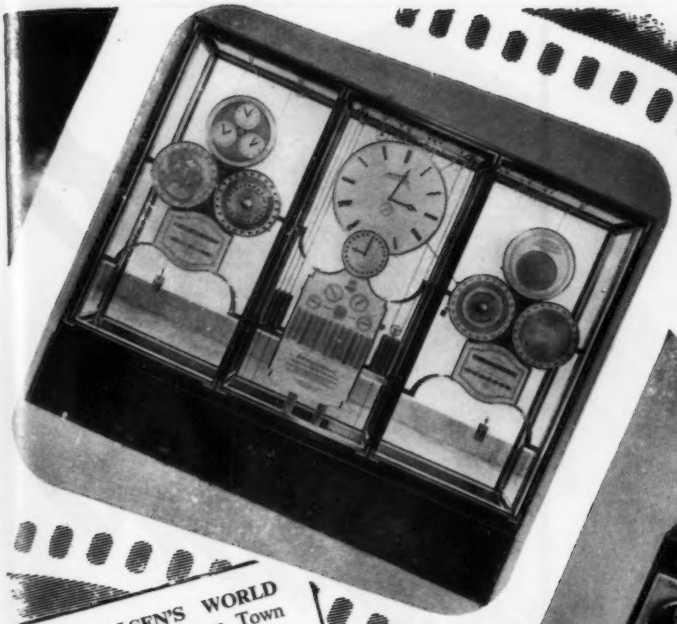
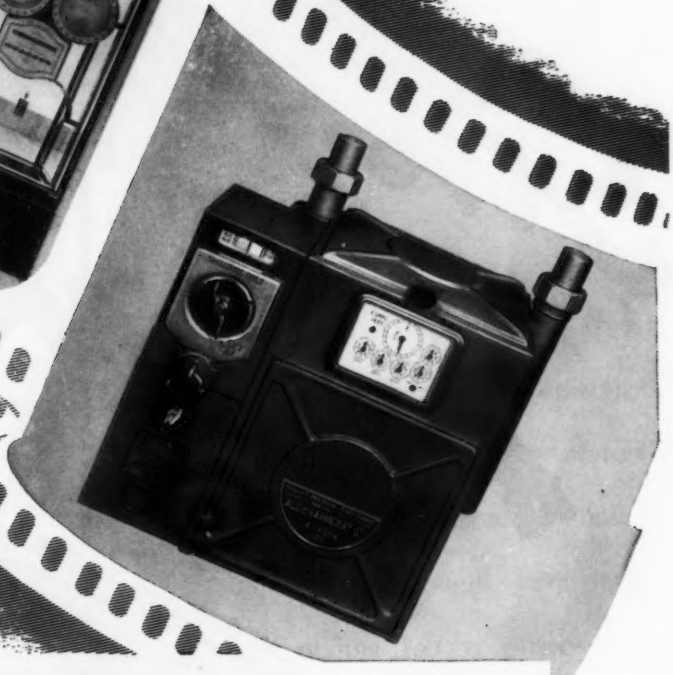


'In the Picture' with A. & M.

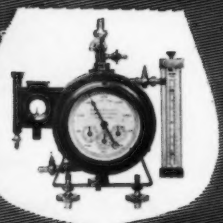
JENS OLSEN'S WORLD CLOCK, in Copenhagen Town Hall, has a deviation of only 2/5ths of a second in 300 years, computes all phases of the moon and all movable feasts each year and, if well cared for, will calculate the position of the stars accurately till 27,656 A.D. Are you doing anything that year?



It's trouble free running that does it!

Trouble-free running is indeed an outstanding feature of the current series A. & M. Meters with the "S" Mechanism. Sound design, robust construction, precise assembly and rigid inspection all add up to a new standard of trouble-free operation.

LABORATORY METERS
1/50th to 5 c.ft. per rev., accurate to 0.1% ±



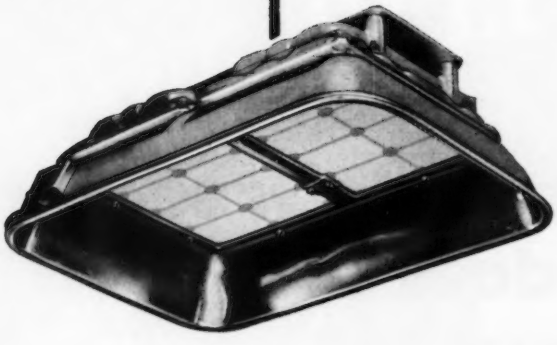
The illustration shows the A. & M. D.1/200 c.ft. "S" type coin meter for 1/- only—simpler and less expensive than the optional which is also available.

ALDER & MACKAY LTD
GAS METER & INSTRUMENT MAKERS

NEW GRANGE WORKS, EDINBURGH, 11, and at London and Manchester.

UGI GROUP

Single-point suspension



HARRIS technicians have developed a new and simplified form of Single-point Suspension for the well known Schwank Patent Gas Infra-Red Radiant Heater. This method of suspension is designed for HS 10 and HS 20 sizes and includes a means of four-point fixing for use where single-point suspension is impracticable.

The Technical development comes as a result of our long experience as gas heater manufacturers and is further proof that "Harris methods have all the advantages."

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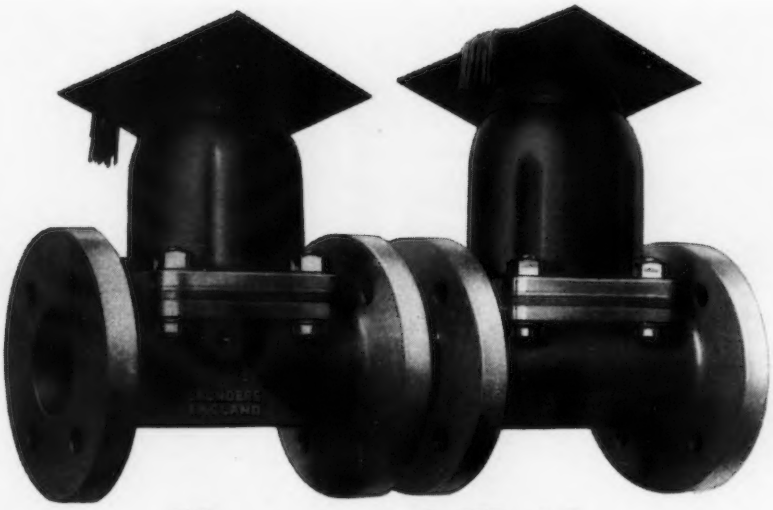
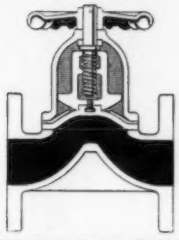
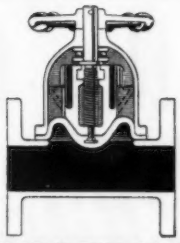


Masters of Fluids

One subject but what a vast vocabulary. One science but what formidable formulæ. From A to Z_nS, from H_2O to $(HO)_3C_6H_2CO_2C_6H_2(OH)_2CO_2H$. From Sand to Sugar Juice and from Sludge to Smog-free-Air.



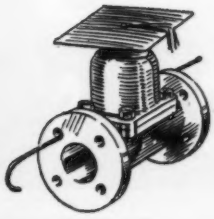
TYPE A FULL FLOW



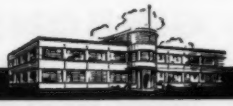
TYPE K FULL BORE

Saunders Diaphragm Valves handle them all with distinction. Type 'A' Valves master the whole catalogue of fluids and where straight bore and use of the rod is expedient—as with not-so-fluid fluids—Type 'K' Vaves take over duty.

SAUNDERS DIAPHRAGM VALVES



. . . . . **and bring me these lines by tomorrow:** *'In all fluid control problems I must refer to Saunders Technical Handbook.'*



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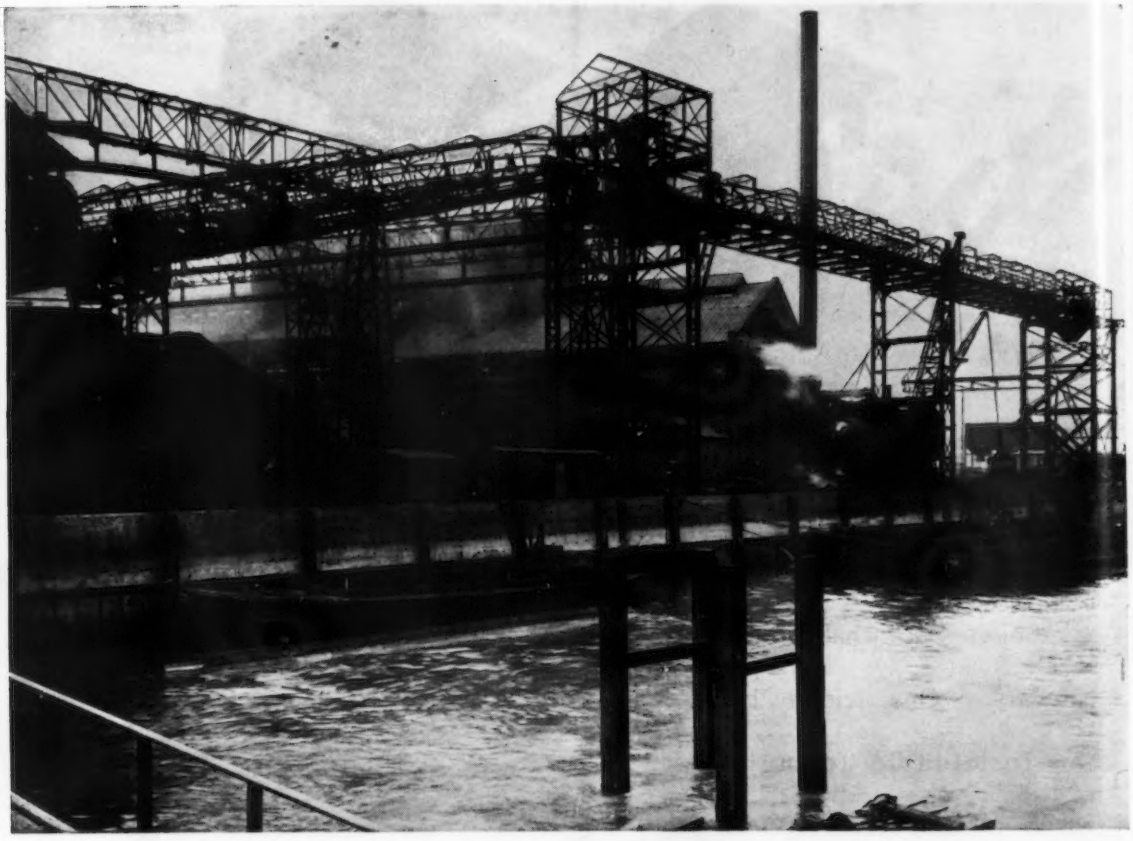
DIAPHRAGM VALVE DIVISION

CWMBRAN NEWPORT MONMOUTHSHIRE



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DESIGNERS & MANUFACTURERS of
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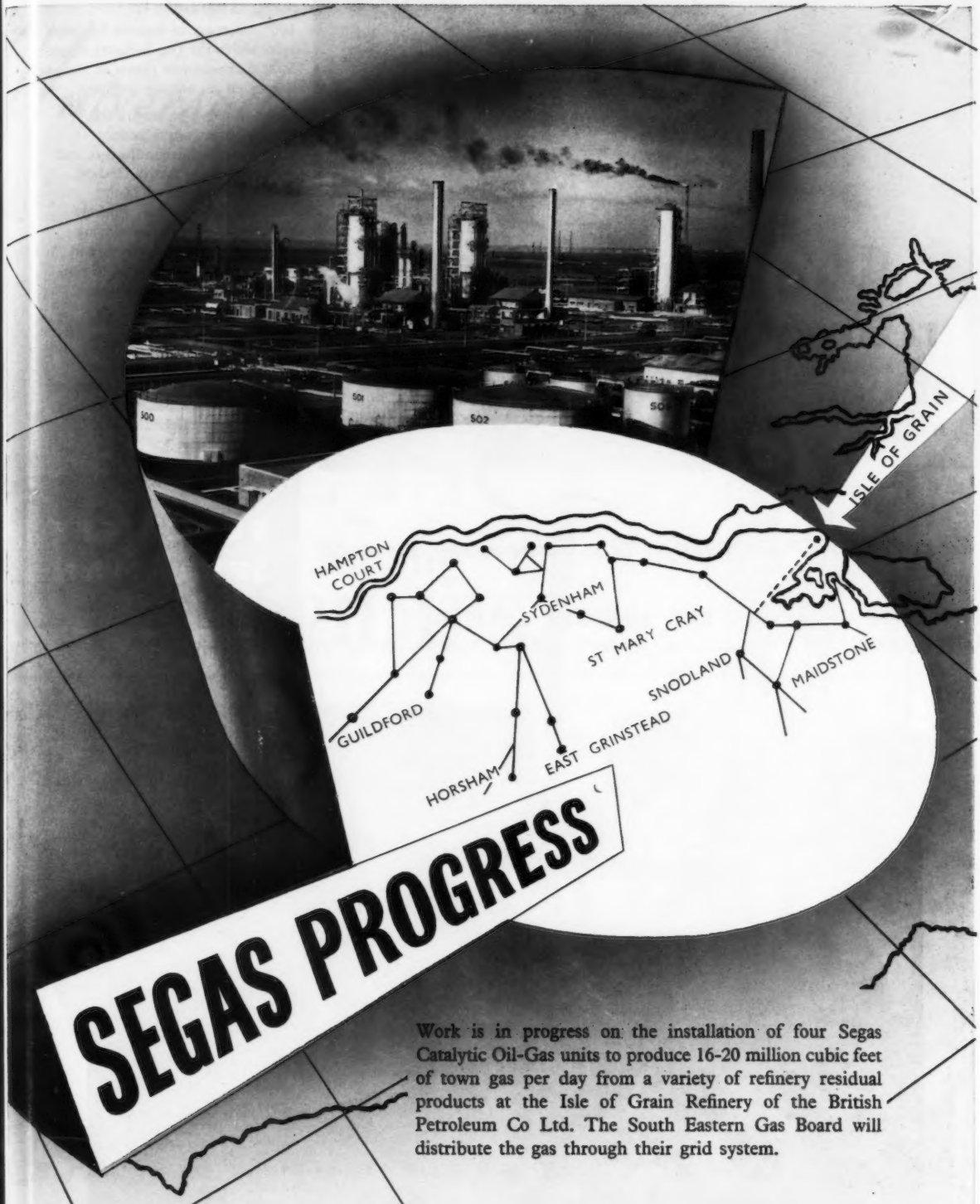


SEGAS PROGRESS

Work is in progress on the installation of four Segas Catalytic Oil-Gas units to produce 16-20 million cubic feet of town gas per day from a variety of refinery residual products at the Isle of Grain Refinery of the British Petroleum Co Ltd. The South Eastern Gas Board will distribute the gas through their grid system.

244

PGC

THE POWER-GAS CORPORATION LTD

(PARENT COMPANY OF THE POWER-GAS GROUP)

STOCKTON-ON-TEES AND LONDON

AUSTRALIA · CANADA · INDIA · FRANCE · SOUTH AFRICA

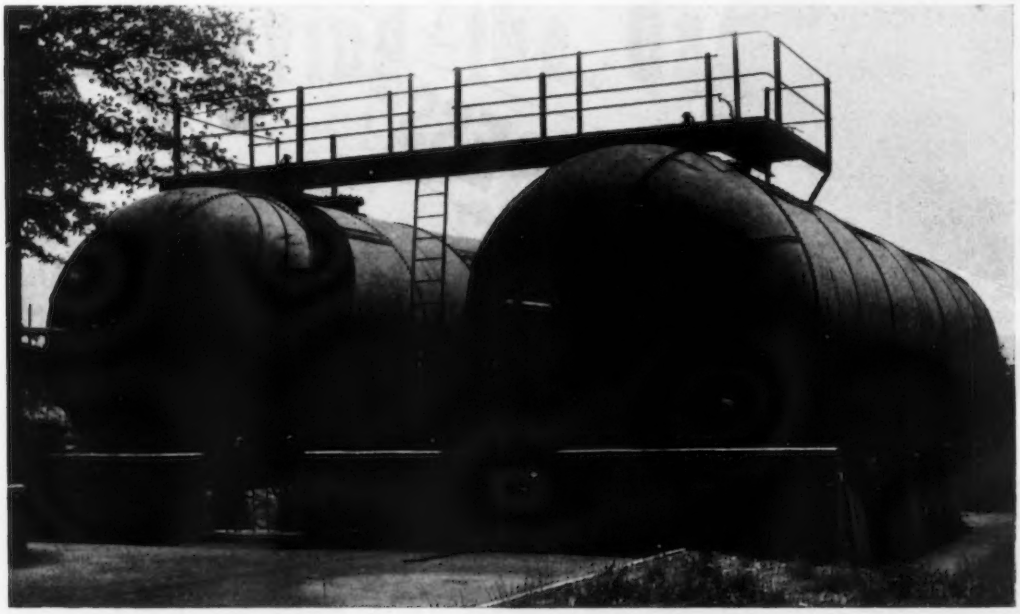
100% recovery of Benzole has been recorded in the Gas Industry where Sutcliffe Speakman plants of the type illustrated are already installed.

These recovery plants are the result of over twenty years' experience in the manufacture and industrial use of Active Carbon. Their capacities range from 250,000 cu. ft. per day. Entirely automatic and with few moving parts, they are compact, clean in operation, and economical to run. Their initial cost, too, compares favourably with that of other recovery systems.
In every way they are the most profitable investments. We are always ready to draw up a complete balance sheet for Benzole recovery in any specific undertaking of the Gas Industry.

to cut Benzole wastage to a minimum, consult

SUTCLIFFE SPEAKMAN

SUTCLIFFE SPEAKMAN AND COMPANY LIMITED,
Leigh, Lancashire. TEL : LEIGH 94. LONDON OFFICE : 2 CAXTON STREET, WESTMINSTER, S.W.1. TEL : ABBEY 3085



RIVETTED HIGH PRESSURE GASHOLDERS 60 LBS PER SQUARE INCH WORKING PRESSURE

CLAYTON SON & CO. LTD., MOOR END, HUNSLET, LEEDS

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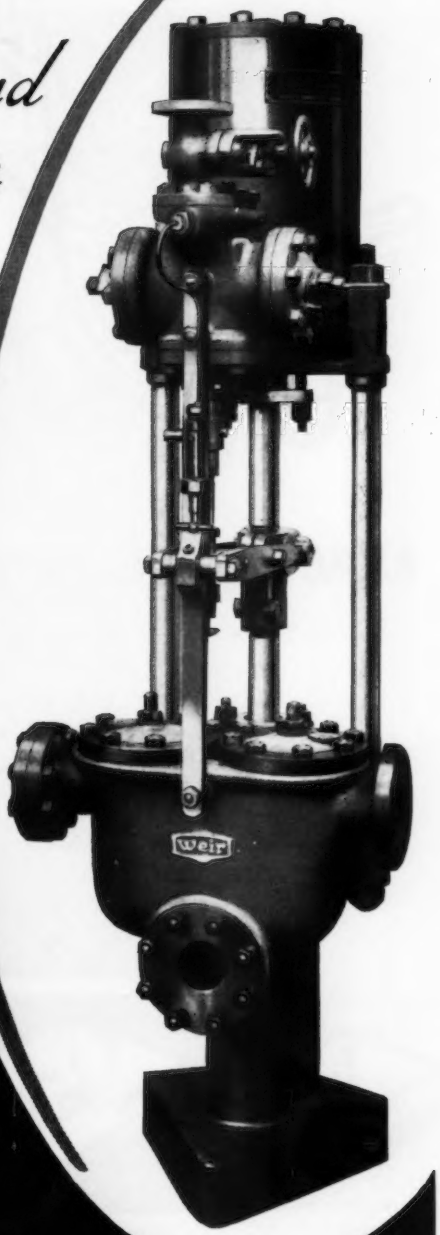
Universally recognised as the most reliable and efficient of their class

WEIR

Direct-Acting FEED PUMPS



Suitable for all types of boilers.

Standard sizes and capacities for discharge pressures up to 300 lb. sq. in.

Special designs for higher pressures.

Write for Publication No. GK. 100

FEED HEATERS
FEED REGULATORS
EVAPORATING AND DISTILLING PLANTS
OIL FUEL PUMPS
DE-AERATORS
REGENERATIVE CONDENSERS
ETC.

G. & J. WEIR LTD
CATHCART GLASGOW

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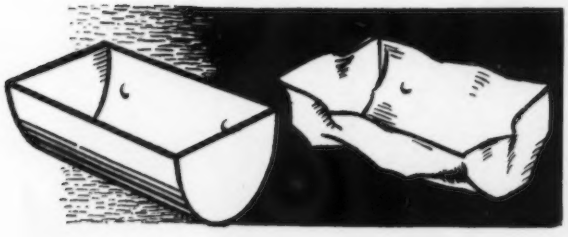
This can be unexpected but when it's a case of elevator buckets we can guarantee that you won't be able "to tell 'em apart" !

You merely send us a worn out or damaged bucket, specify the number required and leave the rest to us.



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We build a complete range of Compressors & Exhausters for air and GAS, suitable for all purposes connected with the GAS industry, including Turbo-Compressors for large capacities, as illustrated below

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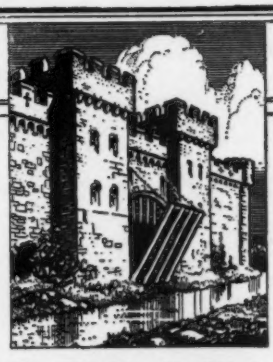

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GAUNTLET

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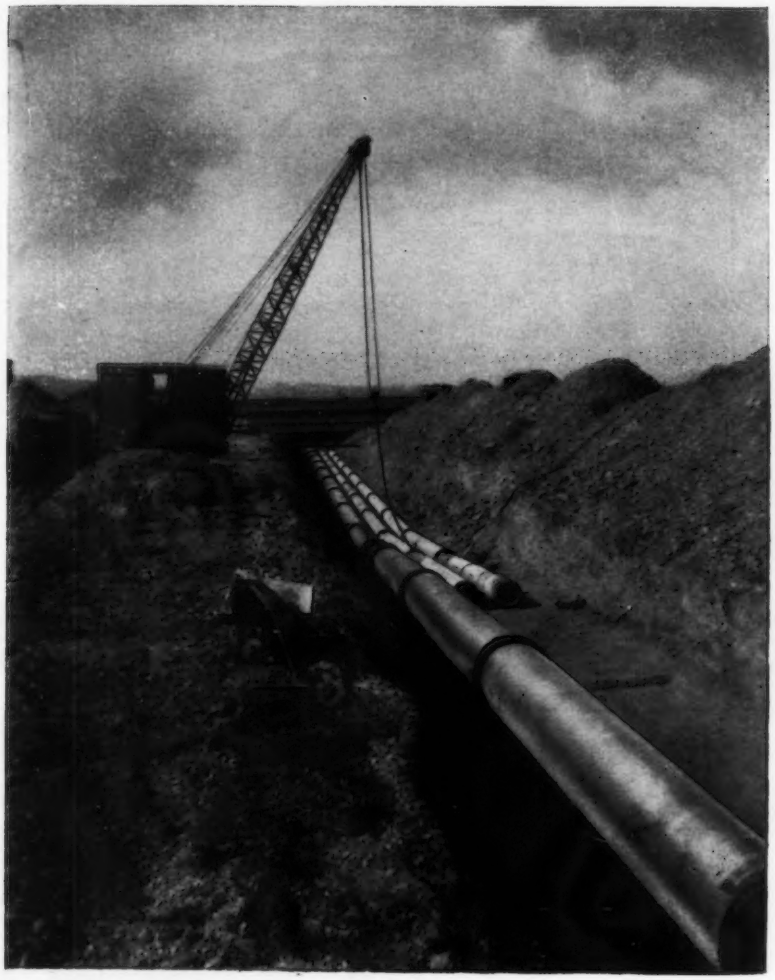
"WELL AND TRULY LAID"



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Over 30 years' sound experience. Skilled and gas-minded workmen. Thousands of miles of mains have been laid by JEAVONS.

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DANGER!

Heading in "The Times", January 8th, 1957:—

"WOMAN GASSED AFTER MOUSE GNAWS PIPE"

Only Copper should be used for Gas Pipes

. . . . . "Yorkshire" **Copper Tubes of course**

THE YORKSHIRE COPPER WORKS LTD. · LEEDS & BARRHEAD

A fine installation for OXIDE CRUSHING

This installation at a large Midland Gas Works has a B.J-D Oxide Crusher, which is doing a really good job of work. Feed is by hopper, as shown in the picture ; discharge is on to a conveyor. The B.J-D Oxide Crusher is also available as a mobile unit, mounted on a bogie; the most recent version of bogie shows a considerable saving in cost, whilst still retaining the necessary strength and efficiency. We shall be happy to give you further details on request.

BJD **oxide crushers**

BRITISH JEFFREY-DIAMOND LTD., CRUSHER AND INDUSTRIAL DIVISION, 15/17 CAXTON STREET, LONDON, S.W.1

BJD/2483

High Grade Refractories
ranging from 34% to 70% alumina

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MOUTHPIECES

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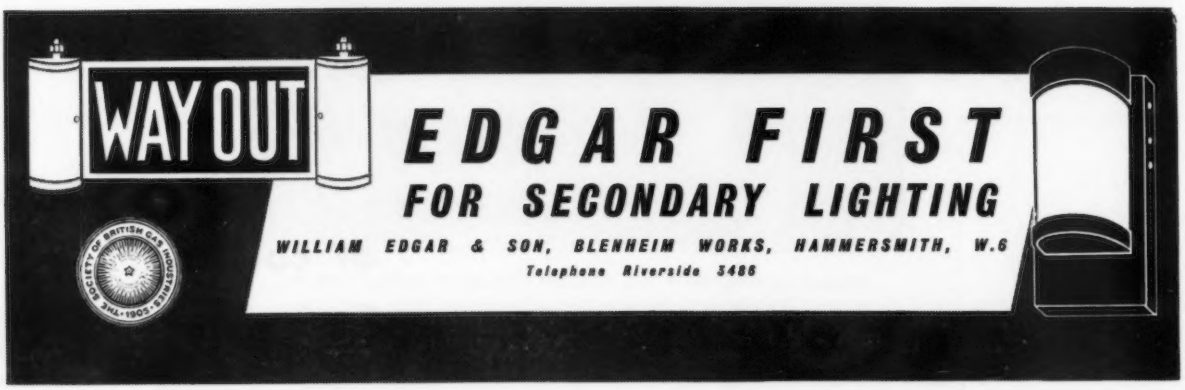
INSULATING
REFRACTORY BRICKS
AND SHAPES • AIR SETTING
PLASTIC & DRY REFRACTORY CEMENTS
for jointing and patching, and strongly recommended as
a protective coating to firebrick work.



Super Refractories:
SILLIMANITE, MULLITE, ETC.
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INSULATING FIREBRICKS

Products Include:
FIREBRICKS Grades E & F
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FOR USE IN

VERTICAL & HORIZONTAL GAS RETORT SETTINGS ; WATER GAS PLANT INSTALLATIONS ; COMPLETE GASIFICATION PLANTS ; OIL GASIFICATION PLANTS ; COKE OVENS ; BOILER SETTINGS, ETC

YES WE KNOW...

FIG. 16C1

it looks like an ordinary central action Cup Drill and Tap but it isn't.

If you have breakages you will be interested. The Cup Drill is our new pattern, it has several times the impact strength of ordinary Drills. Try it and prove it. The Tap is specially made for easy screwing.
To fit any make of Drill Stand, at no increase in cost.

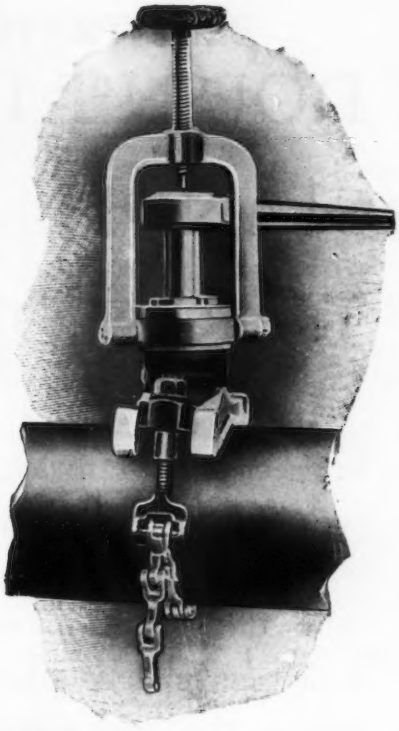

FIG. 18

Send for full particulars and prices

ABBOTT, BIRKS & CO LTD 90/91 BLACKFRIARS RD LONDON SE1

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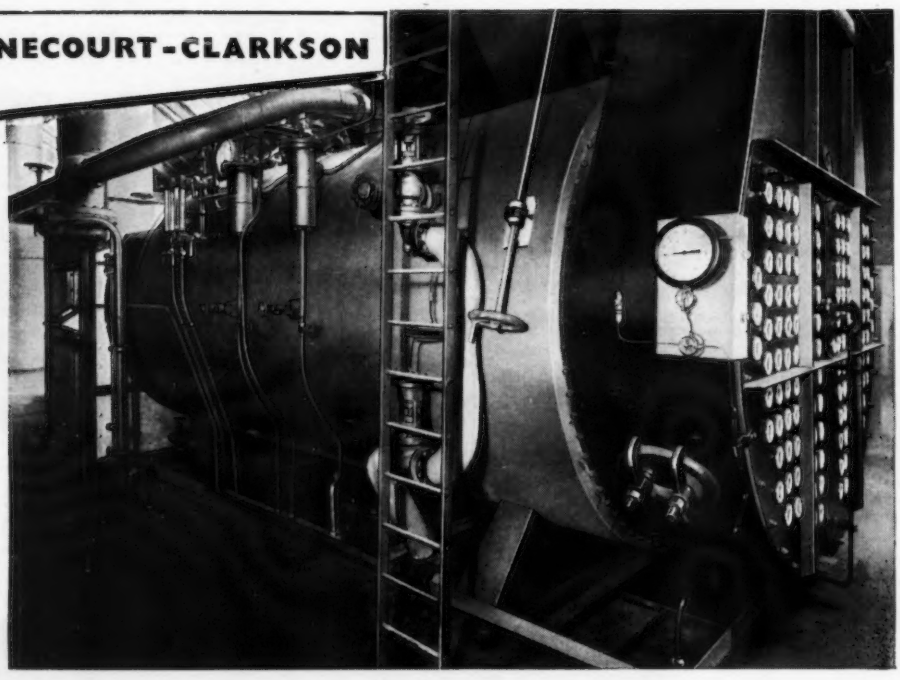
SPENCER-BONECOURT-CLARKSON
LIMITED

SPECIALISTS IN WASTE HEAT RECOVERY PLANT



The illustration shows one of the Spencer-Bonecourt waste-heat boilers at Stoke-on-Trent Gas Works. Similar units are installed on all the Glover-West Continuous Vertical carbonising plant in this works.

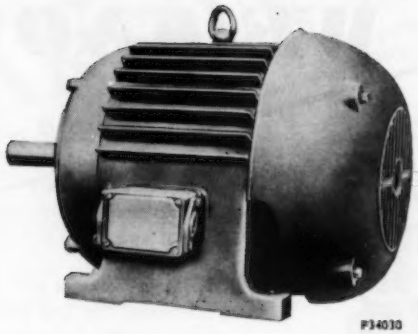
LYNTON HOUSE, 7-12 TAVISTOCK SQUARE, LONDON W.C.1.

Telephone : EUSton 4321
Telegrams : HEATECON, PHONE, LONDON

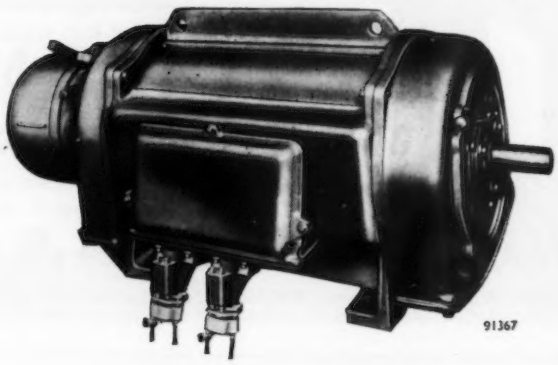
DOESN'T IT STAND TO REASON?

In specifying Metrovick motors you obtain more than compliance with B.S. requirements. Consider the company's research, design and production resources. Add to these the practical advice and service of engineers who really understand the problems of gasworks drives. You then have some of the very good reasons why more and more gasworks are turning to Metrovick motors.

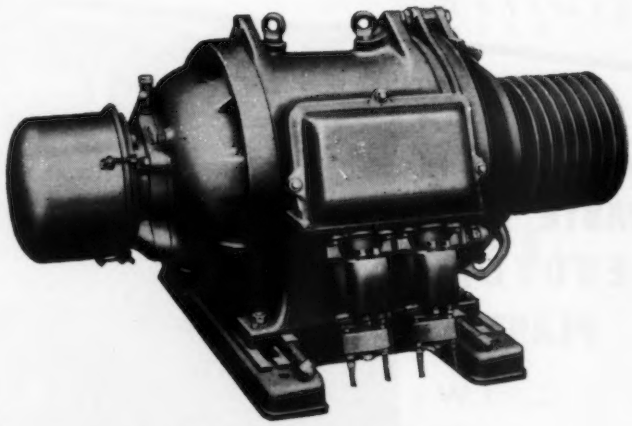
Flameproof motors are also available when required.



Metrovick type KZ squirrel cage totally enclosed fan cooled motors are available up to 40 hp.



100 h.p. and above type HRW high speed (2,960 rpm) drip-proof slipring motor.



100 h.p. and above type RW totally enclosed fan cooled slipring motor.

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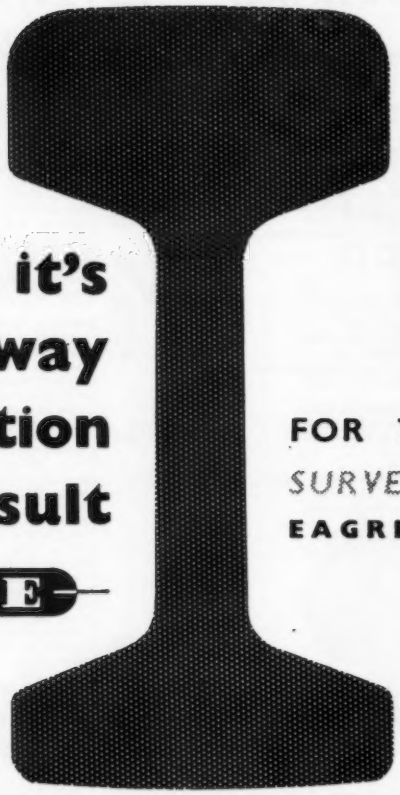

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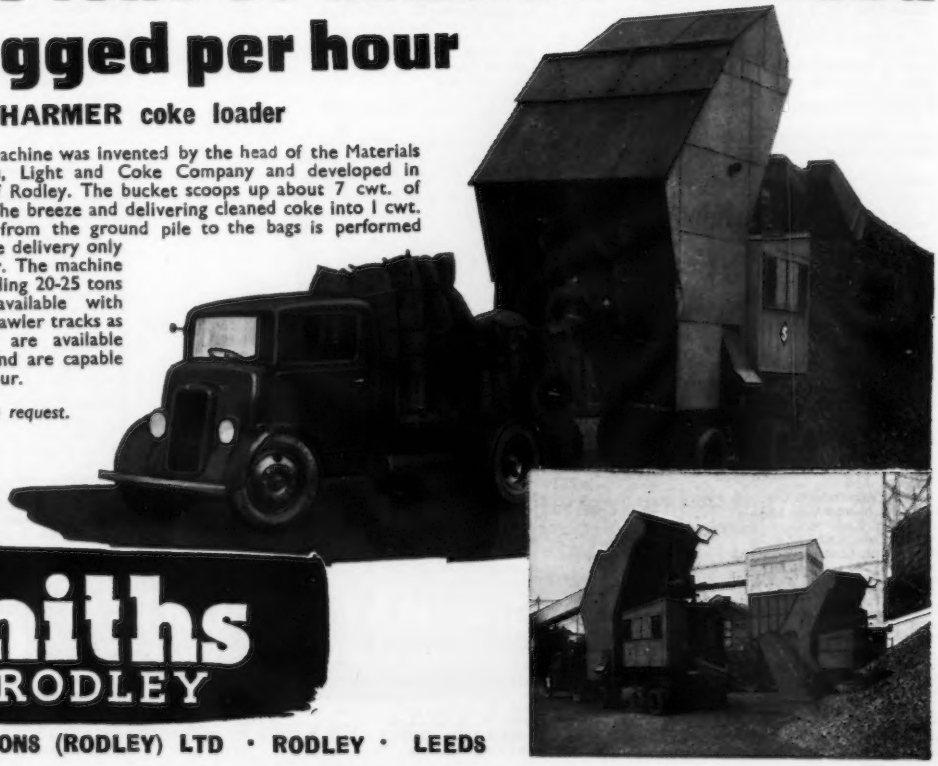

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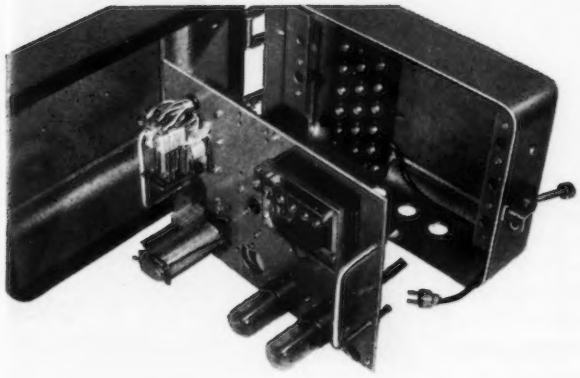

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Gas Journal

VOL. 289 NO. 4881 January 30, 1957

109TH YEAR

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Gas Journal

VOLUME 289. No. 4881. JANUARY 30, 1957. 109th YEAR

Hope for New Zealand Gas

THE Gas and Electricity Co-ordination Committee Act, which may seal the fate of the gas industry in New Zealand, was briefly described in our October 17, 1956, issue. It will be remembered that the Act furthers the Government policy of co-ordinating gas and electricity services on a local basis by providing for the acquisition of essential gasworks by electricity supply authorities, who would then be responsible for both services in their particular areas. The background story of this extraordinary acquisition, 'lock, stock and barrel,' of gas undertakings by the electricity boards is not a happy one and can give the gas industry little cause for satisfaction. It must be appreciated that, unlike Great Britain, New Zealand saw the growth of its gas and electricity industries as a simultaneous development; there was no case, as in this country, of electricity appearing as a newcomer and having to fight a long-established gas monopoly. Both industries grew side by side and in the early years both exhibited that drive and rapid expansion which characterises so much of life in that more youthful country. But whereas the electricity industry under Government support and encouragement, built up its business in a far-sighted, prudent manner, the gas industry tended to place dividends before technical development and when plant deteriorated for want of proper replacement or repair, some of the undertakings continued to be milked with unabated determination and with little thought for the morrow.

In the face of keen electrical competition gas undertakings made little attempt to find new business, and selling as we understand it is largely non-existent; as a result little main laying and distribution work has been carried out for some time and even maintenance has been neglected. Electricity has enjoyed a monopoly in all State housing and the demand has risen so swiftly that the hydro-electricity supply is seriously oversold. In the drought during last summer there were 40% electricity cuts and it was this embarrassment which encouraged the Government to seek gas industry assistance in relieving peak loads on the grid. Apart from this the Government was concerned lest its supply of tar for roads, and ammonia for meat refrigeration, were to dwindle. Clearly the gas industry must be kept alive, at least until the five to eight years' expected electricity shortage is safely past. A political argument ensued: Should the gas industry be nationalised—and the State railways and mines are not very encouraging examples—or should the gas undertakings be handed over to the electricity boards for proper administration?

No doubt wisely, the Government favoured the latter course but matters were complicated by the fact that the electricity industry, far from welcoming this opportunity to acquire their rivals, were anything but enthusiastic. Forced to take over the gas undertakings they talked widely of buying them up only to close them. Gas making constituted a problem about which the electricity boards could claim no intimate knowledge; closure clashed with Government policy. Expert help and advice was needed, and it was to give such assistance that Mr. J. T. Haynes was recently invited to tour New Zealand and assess the technical condition of the industry and suggest steps which could be taken to make the many seriously deteriorated undertakings an effective investment. After three months' travelling in New Zealand—he visited Australia too—Mr. Haynes is now back in this country but the recommendations he has made are of course *sub judice*. However, we can perhaps hazard a few guesses. Mr. Haynes was engaged to give an entirely unbiased opinion and despite the fact that he is a distinguished, dyed-in-the-wool 'gas man,' we feel confident that his approach was unprejudiced and realistic. The close similarity existing between certain of the undertakings taken over after nationalisation in the Western Division of the Southern Gas Board, of which Mr. Haynes, as Divisional General Manager, had first-hand experience, and a number of New Zealand undertakings gives him a particular knowledge of the way in which the latter might be reconditioned and improved. It is likely that he advocated considerable integration with high pressure, small diameter pipes and perhaps the appointment of experienced gas engineers, chemists and salesmen with a roving commission. We must wait and see, but one thing is certain—if there is any real hope of saving the New Zealand gas industry and putting it on a proper footing, the owners apparent could scarcely have a more expert adviser.

The Coke Fire

THE open fire with some convection does not stand very high in the list of efficiencies, but it is a step in the right direction. Evidently, even with the gas fire, some convection is increasing in popularity.

For the small room ' of not more than, say, 1,750 cu.ft. capacity . . . . the openable stove is the proper compromise, but, if it is not acceptable, an inset convector or free-standing convector fire is to be recommended.' The quotation is from the paper by Ludgater and Moss presented to the Institute of Fuel's Special Study of Domestic Heating last May. The report of the discussions at this Conference are now available and we propose to discuss them at length later. For the moment we are considering the paper presented to the Institute of Fuel by W. A. D. Baker of Watson House on January 2 describing Approval Tests for Coke-Burning Domestic Appliances.

Mr. Baker begins by describing briefly ' the three methods now used for measuring the radiation from a solid fuel appliance—the single thermopile, an arrangement of five thermopiles, and the cage radiometer,' and to illustrate their use he reports tests on a ' Fulham,' 16-in. open coke fire using horizontal coke—a dried and screened mixture of 70% 1 in. to 1½ in. and 30% 1½ in. to 2in., with a C.A.B. value of 0.060 cu.ft. per minute. The tests were conducted in two groups, ' cold-to-cold ' and ' flying start ' and ' it was found that at least seven tests were required in each case to permit a satisfactory statistical analysis of the results.' The single-point results were in both cases lower than the others and it would appear that this method is not satisfactory. Using the other methods, efficiencies varied only over 37.2 to 37.9% in the flying-start tests and 33.5% to 36.6% in the cold-to-cold tests.

But the tests of convection appliances are more interesting. The ' flue-loss ' method was adopted, and the apparatus is described in detail. Tests are reported on a closed heating stove and a convector open fire. The former showed efficiencies just over 50% and the latter from 40.5% to 47.0% with the chimney throat restricted and 37.0% with it closed. We are informed that this method ' has now been adopted by the Gas Council for the testing of convector open fires—and for both closed and openable stoves.' It is not claimed that the result is the ' useful efficiency of the appliances as installed in the home ' but that it is nevertheless ' a convenient and accurate method for the comparison of appliances of similar types. Comparison between types can best be determined by field tests.' In this connection, a remark by Eaton and Stephens, in their paper at the Domestic Heating Conference, is to be noted: ' It is becoming increasingly recognised that—two tests are required, a laboratory test to sort out the good and sub-standard appliances and a field test to determine the practicable fuel economies in domestic use.'

In short, the free-standing convector fire with back boiler would seem to be the best that can be done at present with an open fire, using coke for smoke-abatement reasons, heating the small room and providing hot water at very low cost. But why not the still more efficient openable stove, still with back (or surrounding) boiler? We submit the reason is that manufacturers have not produced this appliance (in any quantity) with a satisfactory appearance. We have in fact only seen one which comes near 'to the heart's desire'—a smooth, cream-enamelled, perfectly plain rectangular structure with rounded corners which stood out in the room with no ' fire place ' behind or around it, with unobtrusive doors which slid back out of sight, and no ornament.

Efforts to produce appliances on these lines should, it is submitted, be on no account relaxed, even though they will need to be followed up by efforts to popularise their use. In combination with gas for occasional space-heating, and supplementary hot-water, they appear to present a solution of the domestic smoke problem, at any rate for the immediate future.

Behind the Scenes

THE ' Gas at Work in Industry ' Exhibition to which we devoted considerable space in last week's issue, bids fair to make gas history. A thousand visitors a day are attending the Horticultural Hall and, as we have emphasised before, admission is by invitation only; this means that all these visitors are seriously interested in the exhibits and in many cases are first-class prospects. A substantial number of enquiries are being received, but the results of these will not be known for some time. However, with the industrial load, as opposed to domestic business, only a very few enquiries of the right type can reimburse the organisers within a short period.

Last week we described the exhibits in some detail, but at that time we were unable to reveal the background story of the staging by the North Thames, South Eastern, Eastern and Southern Boards of this first ever all-gas industrial exhibition. Finding a suitable hall to house a display of £100,000 worth of (mainly heavy) equipment, much of it actually working, is no easy job. Even the Horticultural Hall which was finally selected as being the most suitable, had its limitations. There was, for example, the loading problem. The hall has a limit of 1 cwt. per sq. ft. and since this was inadequate for certain of the heavier items of equipment, a webbing of girders had to be constructed, while certain pieces of plant had to be shored up under the floor. Then came the problem of the services, which were very extensive requiring in addition to a quarter of a mile of piping, the use of boosters; for example, water was required at up to 40 lb. per sq. in. *And everything had to be installed in four days!*

How was it done? Answer: By first-class planning. Take the Birlec bright batch quench furnace, the largest piece of plant in the exhibition. To ensure that it could be negotiated through the somewhat restricted doorways a model of the furnace was made, and from this it was determined in what way the plant had to be modified in order to enter the hall. Finally, after this careful planning the furnace was moved in with a bare 3 in. to spare. (Postscript: The Horticultural Hall authorities are now going to alter their doors!) A total of 30 fitters had all the prefabricated piping laid in the first half day and, almost uniquely, the whole exhibition was fully completed on time.

Until February 2 the exhibition will continue to attract old friends and new business, and the two 45-man teams of technical representatives will continue to show that for countless industrial heating processes gas is pre-eminent.

Personal Notes

MR. A. H. SAVILL will become Senior Production Engineer, South Eastern Gas Board, with responsibility for Wandsworth, Croydon, and other works in Surrey and for assisting in planning and co-ordinating the manufacturing programme. Other S.E. appointments, which take effect from April 1, are: MR. T. A. CANNING will become Production Engineer with responsibility for Sydenham and certain works in north Kent. MR. B. C. HINWOOD will become Senior Station Engineer and while continuing as Station Engineer, East Greenwich, he will also be responsible for production at Rotherhithe and Vauxhall. MR. T. W. GIBSON, whose appointment as Distributing Engineer in succession to Colonel J. A. Gould, M.C., was recently announced, will be responsible to the Chief Engineer for the transmission and local distribution of gas throughout South London and the Divisional Distributing Engineers will be responsible to him. Announcing these appointments, the Board say: 'The co-ordination of the manufacture of gas during the past years has enabled the Board to discontinue the divisional organisation for production purposes in the four London divisions and to establish a more centralised form of control from the Board's headquarters.

MR. G. M. BEHR has been appointed Home Sales Manager for both Ascot Gas Water Heaters Ltd., and Ewart & Son Ltd. Other appointments announced by Parnall (Yate) Ltd., consequent upon the re-organisation of the sales forces of Ascot and Ewart are: MR. J. M. BACKHURST, who is Regional Manager for Ascot covering Southern, South Western, Wales, East Midlands and West Midlands Gas Boards, will also cover in a similar capacity the sale of Ewart water heaters to those Boards. MR. G. E. JEFFS, Regional Manager, Ascot, covering Scottish, Northern, North Eastern and North Western Gas Boards, Northern Ireland, Republic of Ireland, and the Isle of Man will also cover in a similar capacity, the sale of Ewart water heaters to these area boards and territories. MR. G. N. MICHIE, Area Manager for Ascot on the territory of the North Thames Gas Board, will also cover in a similar capacity the sale of Ewart water heaters to this Board. He will be assisted by MR. W. J. COLLISON, who will also represent both Ascot and Ewart.

MR. ALEC WALTER STONES has been appointed Manager of the Western District of British Oxygen Gases Ltd., at Birchgrove, Cardiff. He takes the place of MR. J. E. CLARK, who has accepted an appointment with British Oxygen Wimpey Ltd., which was formed recently for the construction of special rocket projects.

ALDERMAN CHARLES NEWTON, M.B.E., and COUNCILLOR W. ALBANS have been appointed part-time members of the East Midlands Gas Board.

MR. F. W. RING-SANTLER, Engineer and Manager, Bude District, South Western Gas Board, has retired. Mr. Ring-Santler entered the gas industry at Malvern, in 1921, where he became assistant to the Council's Gas and Electricity Engineer. He joined the South Western Gas and Water Corporation in 1935 and was appointed Engineer and Manager of the Axminster Gas Company, later becoming Engineer, Manager and Secretary of the Bude and Okehampton Gas Companies. On the nationalisation of the industry Mr. Ring-Santler remained at Bude where he was responsible for all the Board's various activities. Mr. H. G. Stapley, Area Assistant Engineer for Devon and Cornwall, his Deputy, Mr. A. P. Jennings, and station engineers from both counties recently made a presentation to Mr. Ring-Santler.

MR. W. F. CUMMINGS, President of the Western Scotland Junior Gas Association has resigned from the Scottish Gas Board to take up an appointment on the scientific staff of the East Ayr area of the National Coal Board. He is 33 years of age and is at present assistant to the Production Engineer in Glasgow. He joined the Corporation Gas Department in Glasgow, of which he is a native, in 1940, and returned there after military service. He is a member of the Institution of Gas Engineers.

SIR PERCY H. MILLS, has resigned as a Director and as Chairman of Lancashire Dynamo Holdings Ltd., on his appointment as Minister of Power. MR. S. F. STEWARD, the Group Managing Director, has succeeded Sir Percy Mills as Chairman. Mr. Steward was previously Chairman of the South Western Electricity Board and in 1944 succeeded Sir Percy Mills as Director General of Machine Tools.

MR. H. R. WALKER has been appointed Sales Representative for the Horstmann Gear Co., Ltd., covering London, the Home Counties, South East England, and part of Southern England. His address is 1, Bolsover Grove, Merstham, Surrey. (Tel. Merstham 2059.)

MR. G. WARD is leaving the North Eastern Gas Board at the end of February to join the Refrigeration Division of Prestcold Ltd. Mr. Ward has been employed at the Board's display centre as Exhibition and Display Designer in charge of the section for the past five years, joining head office after a short introductory period with the Hull Group, which he joined direct from the Hull College of Art where he obtained his National Diploma in Design.

MR. W. J. COLE, who has represented the Cambridge Instrument Co., Ltd., in the Liverpool area for the last 27 years has now retired. He is succeeded by MR. K. W. TREVATT who has taken up residence at 2, Hightor Road, Woolton, Liverpool.

Diary

February 1.—LONDON AND SOUTHERN JUNIORS: 'Domestic Space Heating by Gas,' A. V. Burrell and G. H. Fuidge.

February 2.—INSTITUTION OF CHEMICAL ENGINEERS, MIDLAND BRANCH: The Midlands Institute, Paradise Street, Birmingham. 2.30 p.m. G.M., 3 p.m. 'Automatic Control of Continuous Distillation Plant,' E. J. Eaton and R. Parkins.

February 5.—MIDLAND JUNIORS: Birmingham District, West Midlands Gas Board, 6.30 p.m. 'Maintenance on Works,' W. E. Dobson.

February 5.—SOUTH EASTERN G.C.C.: Caxton Hall, Westminster, 11 a.m.

February 8. — INCORPORATED PLANT ENGINEERS, BIRMINGHAM BRANCH: Imperial Hotel, Temple Street, 7.30 p.m. Annual Dinner.

February 8. — SCOTTISH WESTERN JUNIORS: 522, Sauchiehall Street, Glasgow, C.2, 6 p.m. 'Corrosion Control,' G. B. Scott.

Plenty of Coke in North East

Mr. D. G. Wilson, North Eastern Board Coke Officer, told the area Gas Consultative Council at Leeds on January 21 that the Board had one of the highest stocks of coal for the time of year that it had held for a long time.

Mr. Wilson said that as far as the Board could reasonably foresee there would be no shortage of gas coke to implement local authorities' plans under the Clean Air Act. The Board would not undertake to support a local authority in its efforts to secure cleaner air and then let it down by failing to supply the necessary coke.

On the question of delivery of coke Mr. Wilson said the Board had co operated with coal merchants and they had encouraged the merchants to sell coke. The Board at one time sold coke at half a cwt. a time but had found that they could not continue without making a loss, so now they were not selling less than 2 or 3 cwt. at a time and might, owing to the present petrol restrictions, have to sell and deliver in quantities not less than 4 cwt.

I.G.E. LECTURES TO CHILDREN

'Combustion' was the theme of a Christmas lecture given by Mr. L. G. Townsend to schoolchildren at Manchester and Liverpool recently.

Organised by the Manchester and District Section of the I.G.E., the lecture had to be given twice in Liverpool, over 180 children being present.

Under the auspices of the Scottish Association of Gas Managers, a lecture-demonstration on 'Flame' was given to 750 Kilmarnock school children by Mr. Frank Brinsley.

N.W. Takes Up the Challenge with Phimax —Another Smokeless Fuel

PHIMAX—a new, easily ignited smokeless fuel—was demonstrated to Manchester's civic heads, health officers, and representatives of the Ministry of Power, women's organisations, and local authorities at Manchester on January 21. Mr. D. P. Welman, Chairman, other members of the North Western Gas Board, and senior officers conducted the demonstration, which took place in the Board's Industrial Gas Development Centre.

The fuel, which is manufactured by a low temperature process, is claimed to have the cheerful blaze and easy ignitability in an ordinary grate of coal—without the disadvantages of smoke, dirt, and wastefulness.

So reactive is Phimax that it will burn successfully in a Devon fireplace without firebars. It even burned vigorously on a steel plate on the floor in the laboratory.

At the demonstration, four fires in similar fireplaces with similar chimney and draught conditions were lined up. The first was set to burn coke in a standard gas-ignited coke grate; the second to burn Phimax with gas ignition; in the third Phimax was lit by sticks and paper, and in the last grate a good quality (No. 3) coal was also lit with sticks and paper. The second, third and fourth grates were of the standard stool-bottomed type.

Clearly, Phimax was more easily ignited than coke or coal under similar conditions and full heat was more quickly attained.

NEW FIREBACKS

New firebacks were used and linen filters placed in the flues. The coke and the gas-ignited Phimax neither stained the firebrick nor soiled the filter. The Phimax which had been ignited by paper and sticks showed some smoke at first—a slight deposit on the fireback and the filter—but soon no more soot was deposited and the fireback was burnt clean, the smoke having come from the paper and wood. Finally, the coal fire, which was easily the slowest to light up, gave off quantities of smoke and soot detected by the filter.

At about 9s. 6d. a cwt. Phimax costs more than coke or good quality house coal. Mr. Welman emphasised that it was not more expensive, however, since the extra heat generated by Phimax might amount to 7½% to 10% over other fuels under similar draught conditions. It burned down to 'the last piece of fuel,' and there was no useless slack or breeze.

So easy was Phimax to ignite, added Mr. Welman, that all-night burning was really a waste of fuel.

To stress the smoke nuisance angle, the Gas Council film 'Guilty Chimneys' was shown.

Phimax is manufactured in a continuous vertical retort at a temperature of about 750°C. Until now there have been difficulties in carbonising coal at temperatures of this order, due to the very low rate of heat transfer throughout the charge. And there were difficulties of getting even heating thoughout the setting. Attempts to surmount these problems have been tried, with varying success.

The Coalite process has been the most successful commercial process until recently when the North Western and North Thames Gas Boards announced the results of research into the problem,

The N.W.G.B. have got over the problem of slow speed of heat transfer at low temperature by making use of the 'Rochdale' or gas injection process. By injecting blue water gas at the base of the retort, at a central point above the extractors, heat in the coke at the bottom of the retort is carried up through the charge so that the carbonisation process is not solely dependent on the conduction of heat from the heating flues at the side of the retort.

This injector gas has the added effect of increasing the porosity and so the reactibility of the resulting coke. When the original Rochdale process was being developed it was applied to normal high temperature carbonisation and made possible a greatly increased throughput of up to 100% above the normal throughput. Applied to the lower temperature carbonisation, it is possible thoroughly to process the coal at a throughput equal to that for normal carbonising conditions.

By this means the production, which is aimed at 130 tons per day at present, is possible with a reduction in gas make of only 15%.

A retort house with a capacity of 4 mill. cu.ft. a day under high-temperature conditions consisting of 32 W.-D. vertical retorts, has been converted at the Partington gasworks in the Manchester Group for the production of Phimax by installing the necessary plant for gas injection. This has involved a good deal of pipework and equipment for keeping a constant flow, within narrow limits, of the injector gas. Also the plant has had to be equipped with safety interlocks to prevent Phimax being withdrawn from the base of the retort until the injector gas has been turned off and the retort purged with steam. The whole arrangement is hydraulically controlled at a point beneath the retort to be emptied and the working conditions of the bottom men have improved accordingly.

COAL USED

A flue temperature of 950°C. is maintained to give a temperature in the retort of about 750°C. The coal used is a Derbyshire coal from the East Midlands Division, N.C.C.B., of rank 802, which is more often employed as industrial fuel or low grade domestic fuel than for gas-making. This type of coal has a high volatile content but is weakly coking and yields the following products on carbonisation per ton of coal carbonised: 47½ therms of high C.V. gas (69 therms after dilution to 450 B.Th.U. per cu.ft.), 16½ gal. of tar, 11¼ cwt. of Phimax and two cwts. of breeze.

An analysis of Phimax shows that it contains 5-10% moisture, 3-6% of ash, 4-8% of volatile matter, and 76-88% fixed carbon with a calorific value of 13,000 B.Th.U. per lb. As it is sold to the public, the fuel is somewhat larger than graded house coal and is about 2-3 in. grading, but it handles well and without undue breakage.

The Lord Mayor of Manchester, Councillor A. Sharp, chats with the Chairman and Deputy-Chairman of the N.W.G.B., Mr. D. P. Welman and Mr. W. Hodkinson.

GAS MADE FROM TAR CHEAPER

But Supplies Are Limited, Says WMGB Chairman

EXPERIMENTS in making gas from tar, instead of from coal or oil, would enable the West Midlands Gas Board to produce cheaper gas at less expensively-built stations, Mr. G. le B. Diamond, West Midlands Gas Board Chairman, announced on January 21.

Supplies of tar were limited and gas made from it would be a secondary source, however.

Successful

He told the West Midlands Consultative Council, meeting in Birmingham, that the experiments—speeded up because of the Suez crisis and believed to be the first in the country—had been more successful than expected. Midland tar had in it 'paraffin bodies' which made it particularly satisfactory for the making of gas.

The Board was so impressed with the experiments that new plant at Coventry (6 mill. cu.ft. of gas a day) and Bilston (3 mill. cu.ft. a day) were being built to make gas from tar.

To what use the tar could be put after the gas had been made from it was not yet known, he said. The Bilston plant should be ready in May or June and the one at Coventry soon afterwards. 'I estimate that at Coventry it will supply 10 to 15% of the city's gas supply.'

Eighty Applications

Mr. Diamond disclosed that while car firms had cut their supplies of gas—a big car manufacturer took as much gas as the whole of the town of Worcester—the Board had received 80 firm applications for conversions from oil to gas since the Suez trouble.

Liverpool Group, North Western Gas Board, opened a new gas service centre at Stanley Road, Bootle, on January 16. It will serve about 100,000 consumers in the Bootle, Litherland, and north Liverpool area. Constructed in the main shopping thoroughfare, the new centre is of white stone, with canopy and recessed glass doors. On the ground floor there is a showroom area of 1,800 sq. ft. Gas radiators are disguised as wall columns and there are two fireplaces for the demonstration of either gas fires or of coke burning grates. There are a number of tungsten-type spotlights which can be focused on appliances displays. The first floor is devoted to the demonstration theatre which seats 150 persons.

West Midlands Charges Will Not Rise 'For the Moment'

MR. G. le B. Diamond, Chairman of the West Midlands Gas Board, speaking at the January Consultative Council meeting gave an assurance that gas charges would not go up 'for the moment.'

But, he said, he could not be committed if costs continued to rise. The margin on which the Board was running was small. 'We are still all right, but we are getting near the bone.'

Mr. Diamond said: 'I have given an undertaking that there will be no increase until after March 31. As far as I am able to see from the figures we have at the moment we can go on for some time yet. That is, unless there is a mounting body of rising costs.'

In the national interests he would like to send coal by rail, but he had to consider the consumer, and road transport was cheaper. By sending coal by road, the Board had saved £250,000 a year. He rejected the suggestion that more use could be made of the canals, as they were too small.

He also disclosed that the Board was to start replacing penny gas meters in April. This was necessary because: (1) With the drop in the value of money, pennies soon filled the meters and caused inconvenience to consumers; and (2) it meant rising costs to the Board, which had to send men to empty the meters.

In the West Midlands there were 150,000 meters giving an alternative of putting in a penny or a shilling. The 90,000 others took pennies only.

Pictured are some of the 35 members of the Midland Junior Gas Association who, with their President, Mr. J. A. W. Stretton, visited the works of the Incandescent Heat Co., Ltd., on January 17. They were welcomed by Mr. J. Fallon, Managing Director, his assistant Mr. G. Pettit and other senior members of the staff. The visitors saw the machine, fitting, pattern, and fabrication shops, the foundries, and the main chemical and physical laboratories.

Ideal Home

GAS STAND WILL SWITCH SPOTLIGHT

THIS year, once again, a large and interesting array of exhibits by the gas industry will be on view at the Daily Mail Ideal Home Exhibition at Olympia from March 5 to March 30.

Continuing the tradition of presenting a new and novel exhibition every year, the Gas Council will invite visitors to their Pavilion to 'Shop for Comfort in Mr. Therm's Modern Market.'

A highlight of the market will be a 'Buy of the Day,' featuring the latest gas appliances in turn.

The Council will also present new ideas in home laundering. Continuous demonstrations will be given in the use of time-saving drying cabinets and gas/electric washing machines.

Parkinson Stove Co., Ltd., introduce what is probably the lowest-priced eye-level grill cooker on the market—the Prefect, which costs only £33 18s. 9d. It is a family-sized cooker, with a large plate-rack for 12 dinner plates, four hot-plate burners and has a storage drawer fitted beneath the hotplate where food can be warmed. Parkinson's will also be exhibiting the Renown Six, the Renown Five, both with eye-level grill, and the Pearl.

Featured in the display of Radiation Group Sales Ltd. will be the New World Cookers, including the Range, the Eighty Five, with push-button operated inner glass door, the Seventy Six, both the latter with eye-level grill, and the New World Cadet, specially designed for the small household. The New World Stratalyn, the gas version of the immersion heater, and the Speedlyn sink heater, with push-button Regulo, will also be on view.

A number of new appliances will be on show for the first time at the Stand of R. & A. Main Ltd. These include: the 'Super Century' cooker, with eye-level grill; the 'Adonis' instantaneous water heater; the 'Jason' bath water heater; a new high-efficiency radiant-convector fire, the 'No. 271,' with selective heat control, and the 'No. 36' refrigerator. Among other exhibits will be 'Century' and 'Economain' cookers and the Morley gas-electric washing machine.

Instantaneous gas water heaters will also be on view at the stand of Ascot Gas Water Heaters Ltd., including the Type 509, which will supply tap-to-teapot boiling water. Also displayed will be sink and bath water heaters, portable gas fires and boiling rings and Compoflex gas tubing in many different colours.

Cannon (GA) Ltd., will exhibit their cooker with the visual grill and plate shelf that folds neatly away when not in use.

Instantaneous and storage gas water heaters will be demonstrated at the stand of Ewart & Son Ltd. The appliances range from small sink heaters to large multipoints, and include the latest small sink storage water heater, available in three colours.

Thomas De La Rue and Co., Ltd. (Potterton Division) will be showing their 'Diplomat 30' and 'Diplomat 44' gas-fired boilers and the 'Warwick' cooker, in five colour schemes.

Aga Heat Ltd., show for the first time the new De Luxe Aga cookers and Agamatic boilers in a choice of attractive colours, and a lighted Aga Model CB cooker and water heater will be seen in a colourful kitchen scheme. Also shown for the first time will be the new Agavector for domestic hot water and background heating.

Sidney Flavel & Co., Ltd., will exhibit the Flavel Envoy at one stand and at a second will be the Flavel Imp and the Mercury.

Stoves Ltd. will present new designs as well as the well-known 'Newhome' gas cookers and appliances.

At the foot of the Cotswolds there is the famous 17th century hotel, the Lygon Arms, Broadway—among its visitors have been such personalities as King Charles I, Oliver Cromwell, and, more lately, Lord Attlee, General Gruenther, Bette Davis, and Charles Laughton. Our picture shows an installation of gas equipment just completed in the kitchens, which comprises: Hot closet and serving top, gas range, steamer, stock-pot stove, upright ovens, salamander grill, gas under-fired griller, and pastry oven.

'Electricity Price May Go Up 2s. 6d. in £1'

ACCORDING to a *Daily Mail* report published on January 21, electricity prices are to be increased throughout Britain by amounts ranging up to 2s. 6d. in the £. The report says: 'Rates for houses, shops and offices go up on April 1; those for street lighting and industry on October 1.'

'The increases mark the end of the "price freeze" announced last June to continue to the end of the financial year on March 1.

'New tariffs for domestic lighting, heating, and power are now being prepared.'

After saying that losses by some area electricity boards during the 'freeze'—higher wages and coal and transport costs—were blamed for the increases, the article added:

'Most of the extra revenue, however, is needed to meet the cost of building and equipping 19 power stations—many of them using atomic energy. Work is due to start on most of them within the next three years. Improvements to existing generating stations and supply generally will ultimately cost several hundred million pounds.

'The last Government decided that the money for all this must be found from the sale of electricity.'

The Central Electricity Authority told the 'GAS JOURNAL': 'Some of the boards who want to adjust their prices may in fact be putting them up after the end of March. But while that may be the case with some of the boards, it doesn't imply that there will be a universal increase in electricity tariffs coming at the end of March.'

At least three boards—the North West, Yorkshire and South West—had tariff proposals announced and then held them in abeyance when the 'freeze' began. And the South Western Electricity Board has just issued a statement that there will have to be an increase in their tariffs in the West Country.

270 Top Business Chiefs Are Entertained at 'Gas in Industry' Lunch

THE cream of British industry in the South of England was represented at the inaugural luncheon of the 'Gas at Work in Industry' exhibition held at the May Fair Hotel, London, on January 22. Among the 270 leading industrialists present were managing or principal directors of such firms as Allied Bakeries, Ltd., Bovril, Ltd., Champion Sparking Plug Co. Ltd., Carreras, Ltd., E.M.I. Ltd., Fairey Aviation Co. Ltd., Ford Motor Co. Ltd., General Electric Co. Ltd., Idris, Ltd., W. & A. Gilbey Ltd., J. Lyons & Co. Ltd., McFarlane Lang & Co. Ltd., D. Napier & Son, Ltd., The Plessey Co. Ltd., Smith's Potato Crisps (1929) Ltd., Waterlow & Sons, Ltd., Macleans Ltd., Metal Box Co., Ltd., Vickers Armstrong (Engineers) Ltd., Lines Bros. Ltd., etc.

They heard Mr. Michael Milne-Watson, Chairman of the North Thames Gas Board, explain the service which the gas industry and in particular the North Thames, South Eastern, Southern and Eastern Gas Boards, sponsors of the exhibition, offers to industry. They might wonder, he said, why these boards should organise an exhibition of gas in industry when it is commonly supposed that industrial emphasis lay in the Midlands and North of England.

42,000 Factories

In point of fact, the area these four gas boards covered was the most densely populated in the world and included no fewer than 42,000 factories, and in certain areas such as West London and Enfield there was an almost unequalled concentration of light industry. They had too, the duty of supplying gas to no less than eight new towns which had been planned not as dormitories but as centres of light industry.

These new towns had a characteristic 'new look' because, unlike the old industrial centres, they were Clean Air towns with hardly a chimney. And gas was largely responsible for this; gas had 'taken the dust out of industry.'

'Make no mistake,' said Mr. Milne-Watson, 'gas is a valuable refined form of heat energy. It may not be the cheapest, but good things never are and never will be cheap. . . . Looking to the future we are full of hope and confidence with regard to gas. New methods of producing it, not merely from coal but from oil as well, should tend, if not to cheapen it, at any rate to stabilise the price, and we all appreciate how important it is for you as manufacturers to know ahead what your fuel costs are likely to be.'

'Basically Unchanged'

Replying for the guests was Sir Norman Kipping, Director-General of the Federation of British Industries. Sir Norman said the industry was 150 years old and the exhibition showed that it had

'Good things never are and never will be cheap . . .'

discovered new applications from a product which was basically unchanged. Its achievement and enterprise were very far from unchanging, however, and the exhibition showed the economical and varied application of the use of gas in industry.

Simple Truth

The Prime Minister had given recognition to the simple truth of the rightful application of the energy contained in coal by the establishment of a Ministry of Power. He knew that Sir Percy Mills would see that the administration of that energy was energetic.

It was a man-sized job, for our difficulty for a number of years would be to bring enough latent energy out of the mines and the oil wells to the point of application. Such a refined fuel as gas must not be wasted and that was where the exhibition came in, showing that the application of gas was economical when correctly used and without waste, for where a refined fuel was concerned the cost of waste was higher.

Guests included Sir John Maud, Mr. David Renton, Mr. M. T. Flett, Sir Graham Cunningham, Sir Harold Wernher, the Earl of Strafford, Sir Francis Brake. In addition to the chairmen of the other three gas boards—Mr. C. H. Leach (Southern), Mr. W. K. Hutchison (South Eastern), and Sir John Stephenson (Eastern), the following board chairmen were present: Mr. G. le B. Diamond (West Midlands), Mr. T. Mervyn Jones (Wales), Mr. R. S. Johnson (East Midlands), and Mr. C. H. Chester (South Western).

Visit to Exhibition

The Gas Council was represented by its Chairman, Sir Harold Smith, Deputy-Chairman, Sir Henry Jones, and Secretary, Mr. F. G. Brewer. Following the lunch the company proceeded to the Royal Horticultural Hall to view the exhibition which remains open until February 2.

Clean Air Handbook

A handbook explaining the main points of the Clean Air Act, 1956, was published on January 25 by the Federation of British Industries, entitled 'The Clean Air Act, 1956: a Guide for Industrialists' (FBI, 21, Tothill Street, London, S.W.1, price 2s.). It describes the provisions dealing with dark smoke, smoke from furnaces, grit and dust from furnaces, smoke control areas and smoke nuisances, as well as those concerned with special cases, the establishment of the Clean Air Council and the penalties which may be incurred under the Act.

FURNACE TO BURN 20,000 CU. FT. AN HOUR, G.C.C. TOLD

MEMBERS of the South-West District Committee of the Scottish Gas Consultative Council, following a meeting and lunch in Ayr, visited the premises in the town of the Scottish Stamping and Engineering Co., Ltd., at Neptune Works.

There they were told by Mr. J. F. Insch, Managing Director, of a heat treatment furnace which, when it is in operation, is expected to burn 20,000 cu.ft. of gas per hour for 24 hours a day and five days a week. It was explained that this apparatus was to be used in the concern's production of crankshafts, which it was computed would total 180,000 a year.

European Community Coke Output Hits Record Level

OUTPUT of coke in the European Coal and Steel Community in 1956 reached a new record level of 74,784,000 metric tons, according to provisional figures released by the Statistics Division of the High Authority. This represented an increase of 9.0% over the 1955 figure of 68,633,000 metric tons.

Total coke stocks at coking plant at the end of December, 1956, stood at 531,000 metric tons, as compared with 555,000 at the end of December, 1955, and 539,000 at the end of November, 1956.

Pit-head coal stocks at the end of December, 1956, stood at 5,930 000 metric tons as against 7,511,000 at the end of December, 1955, and 6,618,000 tons at the end of November, 1956.

Flavel Workers to Go on Short Time

All 750 workers of Sidney Flavel and Co., Ltd., Leamington, gas cooker manufacturers, are to go on short-time next week. Twelve per cent. will work a three-day week; 48% four days, and 40% five days. In a statement on January 23 the firm blamed a trade recession.

The management said the shop stewards were in complete agreement that short-time working was preferable to sackings.

Electricity Tactics 'Vicious' Declares Scottish Chairman

TACTICS adopted by the electricity boards in Scotland in connection with electrical supply to new houses were vicious in the extreme and an example of monopoly dictatorship in one of its worst forms, said Mr. Sydney Smith, chairman of the Scottish Gas Board, speaking at a luncheon following the opening of the new gas showroom in Kilmarnock.

The board owed much to Kilmarnock Town Council and Ayr County Council, said Mr. Smith, for their public-spirited policy in providing gas for new houses. This was not the case with many local authorities, and it was apparent that 'our electricity friends' were adopting tactics specifically designed to exclude gas from new houses.

'We welcome competition, provided it is fair, because it means ensuring progress in development,' added Mr. Smith, 'and particularly so where competition concerns two public service organisations both of which in the national interest should make the best use of the capital available to them in a period of financial stringency.

'The electricity boards are seeking—and indeed succeeding in many cases—to take unfair advantage of the monopoly element of their electrical supply to new houses. Gas is big business,' he added, 'and a business which provides a national service that Scotland can ill afford to see strangled by the voracious appetites of monopolistic dictatorship.'

Science Masters See Gas Display

Many of the 900 science masters who attended the annual meeting of their Association at Cambridge saw a display of educational literature arranged by the Cambridge Division of the Eastern Gas Board. Gas Council films supplemented the display.

A striking background of posters illustrated the manufacture of gas, coke and by-products from coal, and the distribution of gas.

IF MUSIC BE THE FOOD OF LOVE . . .

Mr. James Dow, Divisional Controller for Lanarkshire, presided at the final of the county youth cookery competition organised by the Scottish Gas Board and held in Motherwell.

While the competitors were busy cooking, the band of the Scottish Gas Board (Glasgow Division), under the conductorship of Mr. Dugald M. MacBrayne, played musical selections.

An inter-school quiz had as compere Mr. Robert Dunnett, well-known B.B.C. commentator and radio feature writer and the recently-appointed Public Relations Officer of the Scottish Gas Board.

A 13-year-old Riggend boy, Robert Mather, was judged the winner of the cookery competition.

At Least Gas Isn't Up the Pole!

BANGOR (Co. Down) Borough Council at their monthly meeting on New Year's Day handed a bouquet to the local Gas Undertaking for maintaining unbroken supplies during Christmas and a brickbat to the Electricity Board for its policy of using overhead cables.

Councillor S. Napier said that if the gas were on poles it, too, would have been unable to keep up supplies during the Christmas snowstorm.

Alderman C. F. Milligan congratulated the Gas Committee on its advertisement in the local Press 'Thank Goodness for Gas.' He felt that if the gas undertaking had a salesman in the Crawfordsburn area at the present time he would get a very sympathetic hearing about his appliances, as the people there were without electricity throughout the Christmas holidays.

A review of the Belfast Corporation Gas Department for the past year showed that the Department finished its financial year 1955-56 with a deficit of £25,269. The price of coal had been increased without prior warning by nearly 13s. per ton, and the additional expenditure—estimated at £156,000 per annum—had to be borne for six months before any additional revenue could be obtained from increased gas prices. The deficit was due entirely to this particular item, and it was met from a special reserve created recently for such a contingency.

Gas sent out during the year amounted to 5,605 mill. cu.ft., but the demand was affected by mild weather and showed a reduction of 108 mill. cu.ft. Sales of coke at 81,436 tons, were a record. The revenue from coke was £458,820—an increase of £43,985 on the previous year.

New Dwellings Have Five Gas Points

AN Ascot gas water heater, Type 709, and a 'Renown Six' gas cooker by the Parkinson Stove Co., Ltd., are among the appliances to be seen in the kitchen of a show bungalow at Waterlooville, near Portsmouth, which opened to the public on January 22 for six months, and which can be viewed week-days and Sundays from 9 a.m. to 9 p.m.

The 'Cranley' show bungalow is a sample of between 900 and 1,200 bungalows and houses being built by E. & L. Berg, who, in conjunction with the British Standards Institution, invited the Press for a preview recently. The bungalow is almost entirely equipped and furnished with British Standard items.

All the dwellings are to be fitted with four gas points in the kitchen and another in the lounge. In the lounge of the show bungalow is the 'Tor' continuous-burning fire by Jones & Campbell Ltd., guarded by a 'child-proof' fireguard, a prototype sponsored by the Wire Goods Manufacturers' Association, which hooks into chains firmly fixed on each side of the fireplace. A gas point is installed.

The bathroom contains a gas-heated towel rail by John Harper & Co. Ltd. This appliance consists of two heated towel racks, with additional heat radiating to warm the bathroom.

SMOKELESS FUELS EXHIBITION

'The Scientist at Your Hearth' is the title of an exhibition to be held by the Solid Smokeless Fuels Federation at Charing Cross Underground Station from February 4 to 23.

The exhibition will feature a real laboratory in which will be seen the testing of natural and manufactured solid smokeless fuels to ensure their quality and suitability for home heating, and also the testing of modern appliances to ensure maixmum efficiency. The techniques on show will be those employed from day to day by the producers of solid smokeless fuels.

Sheffield Inspectors Came, Saw . . . and Knew What They Wanted

TWO Factory Inspectors attending the Sheffield and District Foundry Exhibition took an interest in flame failure and other protective controls on the East Midlands Gas Board stand.

As a result, the latest technical reports have been given to the Chief Inspector at Sheffield for circulation to his entire operational staff.

Also on the Board's stand were a 20-cwt. ladle with modern heating equipment, a Ballard recirculated hot air oven for drying cores, small moulds, etc., a range of live burners of various types, and modern gas/air mixing equipment with some industrial burners for furnace applications.

Improved Drying Chamber for Foundry Moulds*

The original drying chamber worked according to the waste gas regeneration system which increases the compensation of temperature by the convective transmission of heat. As shown in Fig. 1, the chamber was heated by four injector burners which were mounted in a combustion chamber at the bottom. The waste gases were drawn out at the same level on the other side into a flue leading to the chimney. From this flue, the exhaust gases are drawn through a branch flue, and, after passing through a regenerator in which they are mixed with fresh air, return to the combustion chamber. To investigate the reasons for the unsatisfactory working of the chamber, the required instruments to check heat, pressure and draught conditions were mounted in the various parts of the chamber, which has a working space of 70 mm. The points under consideration were: The chimney draught, the draught and pressure conditions at the regenerator, the excess of air, the quantity of gas at the burners, analyses of waste gases including their moisture content. It was then found that the chamber could be divided by a curve somewhat similar to a hyperbola, into two parts, of which one showed high pressure and high temperature and the other low pressure and low temperature. The difference in temperature was almost 130°C. In spite of excess air of 94%, the burners did not supply a sufficient amount of flue gas, although the working temperature was only 450°C. All remedies to prevent the entry of cold air were tried and finally it was decided to rebuild the chamber and arrange the burners at both sides and to pass the exhaust gases through a channel built into the centre part of the furnace floor. The injector burners were replaced by low-pressure burners, and the gas from the regenerator flowed down two channels instead of one to the burners on either side of the furnace. It was found that the regulation of the burners was easier and a check of the temperatures and pressures gave the satisfactory results shown in Fig. 4, while the diagram of the altered arrangement is shown in Fig. 3. Apart from the technical advantages

Concluded on p. 251.

Gas-Wärme. *Vol. 5. No. 10. October 1956. p. 360.*

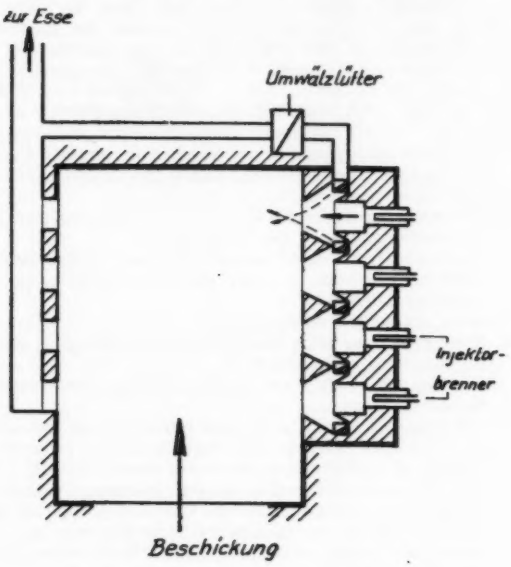

Fig. 1.—Diagram before reconstruction

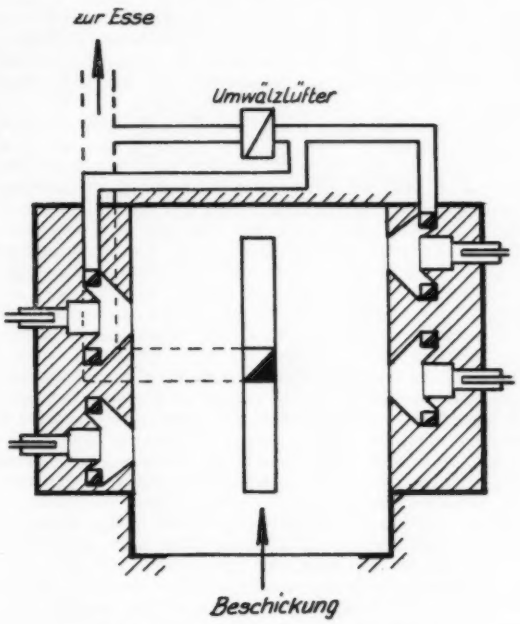

Fig. 3.—Diagram after reconstruction

zur Esse	... ...	to the chimney
Umwälzlüfter	... ...	regenerator
Beschickung	... ...	charging side

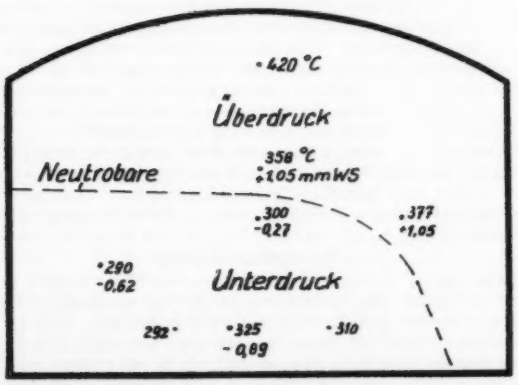

Fig 2.—Temperatures and pressures before reconstruction

Injektorbrenner	... ...	injector burner
Uberdruck	... ...	high pressure
Unterdruck	... ...	low pressure

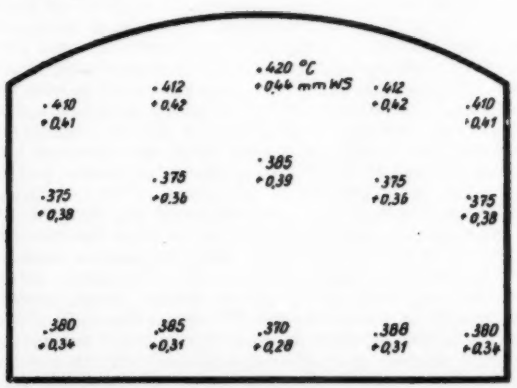

Fig. 4.—Temperatures and pressures after reconstruction

Neutrobare	... ...	separating line
WS	... ...	water gauge

From a Paper to the Institution of Gas Engineers, London and Southern Section, January 15.

The Production of Water Gas at Beckton

By E. SPIVEY, Ph.D., B.Sc.
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and
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THE purpose of this paper is to describe in detail some of the specially interesting features of the design of the two large new C.W.G. plants erected at Beckton and to give some information about the operation and performance of the first plant since it was put to work in 1951. The principal results of a performance test on the second large new plant are also given.

The base load duty defined for the first new plant when planning started in 1944 was that it should produce 6 mill. cu.ft. a day of blue water gas required for the calorific adjustment of the coal gas produced at Beckton in horizontal retorts and coke ovens. It was a requirement of the design that there should be 100% standby for this base load duty and that the plant should make carburetted water gas with a calorific value of up to 520 B.Th.U. per cu.ft. when demanded by the seasonal load. For this latter duty no standby capacity was to be provided but emphasis was placed upon maximum reliability.

A survey was made of all the information then available on the operation of blue water gas and carburetted water gas plants for the purpose of determining the design features and operating conditions which would give maximum overall efficiency for the production of blue water gas associated with maximum thermal output when carburetting with gas oil. It was concluded from this survey that a plant specially designed for blue water gas production might be expected to give the following results: A consumption of 33.5 lb. coke (dry) per 1,000 cu.ft. of B.W.G. of a C.V. of 290 B.Th.U. per cu.ft., a production of 86.5 therms of B.W.G. per 1,000 lb. of dry coke, or 194 therms per ton to raise 29 lb. of steam in the generator boiler, and 48 lb. in the waste heat boiler per 1,000 cu.ft. of B.W.G., with no up-run B.W.G. passing through the waste heat boiler, and to consume 53 lb. of steam per 1,000 cu.ft. of B.W.G. for gasmaking. To achieve these results it would be necessary to operate with a high blast pressure for a small percentage of the operating cycle and to have a greater depth of fuel bed in the generator than is normally provided for carburetted water gas production.

In order that the overall thermal efficiency of the process should be as high as possible it would be necessary also to provide a fully and correctly integrated steam and power system. Calculations and tests on a modern all electric powered plant showed that the power consumption of a new plant with all electric driven ancillary equipment would be approximately 0.90 kW. per 1,000 cu.ft. of B.W.G., whereas the quantity of 48 lb. of steam available from the waste heat boiler would, if raised at 300 lb. per sq. in. and exhausted at 15 lb. per sq. in., yield 1.60 kW.

When making C.W.G. it was anticipated that the production of steam in the waste heat boiler would be at the rate of 35 lb. per 1,000 cu.ft. of gas which, under the pressure conditions described above, would yield 1.15 kW. The power requirement of a C.W.G. plant with all electric driven ancillaries was known to be about 0.80 kW. per 1,000 cu.ft. C.W.G. The production of steam in the generator boiler was expected to be at the rate of 18 lb. per 1,000 cu.ft. of gas, providing a total of about 53 lb. for process use, which quantity would be consumed completely when operating with an air to steam ratio condition of around 36 cu.ft. of air per lb. of steam.

It was concluded that the system of utilising steam from the waste heat boilers for power production in a back pressure turbine feeding low pressure steam to the generator for process use would make B.W.G. production independent of external steam and power supplies and C.W.G. production very nearly so. It was clear that the problem of applying this system would be greatly simplified if sets were built in pairs and operated with staggered cycles so as to make the production and consumption of steam as continuous as possible. It was decided therefore to provide four generators arranged as two pairs, each pair to be capable of producing at least 6 mill. cu.ft. per day of B.W.G. with a maximum efficiency of gas production. When maximum thermal output was required all four generators would work together to produce C.W.G. To assist in obtaining the desired results the following features of design were specified:

1. Generators to be of the dry seal self clinkering type with concentric grates of the Haug pattern.
2. Mechanically vibrated screens for the de-breezing of coke at the inlet to each generator, discharging into weighing hoppers.
3. Back run process of operation.
4. Dust extraction from the blow and make gases at the top outlet of each generator.
5. Combustion of the blow gases in the gas main entering the carburettor.
6. Horizontal fire tube waste heat boilers to produce steam at 300 lb. per sq. in. gauge. Superheaters to be provided capable of raising the steam temperature to 590°F. The superheaters in the boilers of sets forming a pair to be connected in series in order to ensure a continuous flow of steam and to minimise temperature fluctuations.
7. Arrangements for passing up-run B.W.G. through the waste heat boilers, but this procedure to be discontinued when C.W.G. is being made.
8. Removal of dust from the waste gases before the stack valves with continuous automatic wetting and discharging of the dust as collected under gas pressure.
9. The high pressure steam from the waste heat boilers to pass through the high pressure stage of a two stage turbo-alternator and thence to a low pressure accumulator for process use. The generator boiler steam to join the pass-out steam at either the inlet or outlet of the accumulator. Low pressure steam, surplus to process requirements, to pass to the vacuum stage of the turbo-alternator.
10. All plant ancillaries to be electrically driven.

The contract for this large new plant, later to be called No. 2 C.W.G. Beckton, was placed with Humphreys & Glasgow and the design then became a joint effort of that Company and of the Gas Light and Coke Company. An isometric drawing is shown in Fig. 1.

Description of Plant

The choice of dry seal generators with Haug pattern grates was a logical one having regard to the outstanding results being obtained at Brentford in similar generators. The sets at Brentford have 8 ft. diameter generators and each had proved capable of producing over 4 mill. cu.ft. of C.W.G. per day at 500 B.Th.U. per cu.ft. with very high efficiencies of coke and oil conversion. The principal advantage of the dry seal generator is that it permits the use of blowing pressures above the limits of 36 to 42 in. W.G. which are imposed by the requirements for ash extraction on the wet sealed generator.

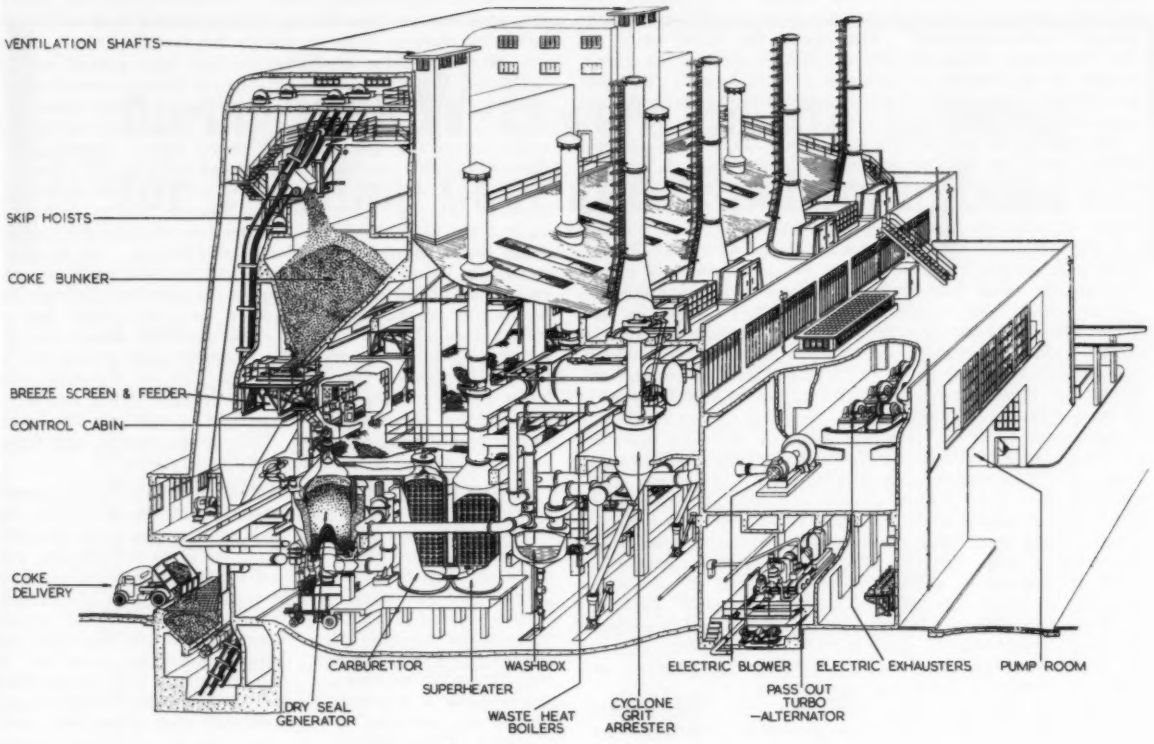

Fig. 1. No. 2 water gas plant at Beckton.

Consideration of the optimum conditions required for B.W.G. production indicated that a blowing pressure of not less than 50 in. W.G. was essential. It was decided that generators of 9 ft. diameter would be suitable for Beckton, this size providing some margin of capacity, and that one air blower capable of delivering 25,000 cu.ft. per minute of air against a pressure of 55 in. W.G. should be provided to serve each pair of sets.

To obtain maximum thermal outputs and gasification efficiencies from water gas generators it is essential that the coke charged to the generators should have average piece dimensions not less than about 2 in. and that it should be free from smalls below 1 in. in minimum dimension. The decision to employ high rates of blowing also made it desirable to provide the most efficient means available for de-breezing the coke before it enters the generators so as to reduce the carry-over of fuel into carburettors. Accordingly mechanically vibrated screens were specified and in the final design are combined with short conveyor belts for feeding and with weight balanced collecting hoppers, the filling of which controls the feeding belts. Integrating mechanisms on the weighing arms of the collecting hoppers make possible rough weighing of the coke charged to each generator. The contractors later designed a device comprising an automatically actuated feeler bar which probes the generator in each operating cycle to determine the level of the fuel bed and whenever that level changes adjusts the balance of the coke collecting hopper to increase or decrease the charges as necessary. These devices were installed on one pair of generators and have worked well.

High rates of blowing tend to increase the carry-over of coke and ash from the generator and the accumulation of such materials in the vessels following the generator can seriously affect performance, so it was decided to examine the possibility of designing a dust collector suitable for building into sets between the generator and carburettor. It was laid down that the device must not require any increase in the distance between the centres of the vessels and must not produce any considerable pressure loss. This is shown in Fig. 2.

The circular outlet from the generator is 36 in. in diameter and this is tapered laterally to 18 in. The main is continued by a rectangular duct 18 in. wide by 48 in. high internally which curves through a horizontal semi-circle before joining smoothly into the 40 in. diameter inlet main to the carburettor. At the down stream end of the curved duct a nearly vertical heat resisting steel vane 6 in. wide and parallel to the axis of gas flow is fitted so that it projects into the gas stream 1 in. from the outer edge of the duct at the top and 3 in. at the bottom. Provision was made for altering the angle of this shave-off blade. Dust removed by this blade falls down a duct into a water sealed automatic discharging device. It was calculated that with a suitable 3 in. lining the gases would be cooled by less than 5°F. in passing through the duct and that the maximum pressure loss produced would not be more than about 1 in. W.G. above that of a straight connection of the same internal cross sectional area. It was arranged that the admission of secondary air should be made immediately after the shave-off blade. When this design was developed by the contractors it became clear that the brickwork construction would be difficult and must involve some risk of breakdown. Accordingly, it was decided that these devices should be fitted to one pair of sets only. This form of dust collector has become known at Beckton as the 'lion's tail.'

The sets at Brentford are equipped with ring manifolds around the generator to carburettor main through which the secondary air enters the blow gas stream at right angles to it through a circumferential slot in the brickwork lining of the main. Many tests on these sets had shown that this arrangement produces more satisfactory combustion of the blow gas than any other arrangement tested. Such ring manifolds are, however, expensive, particularly in large sizes, and when tests on a set equipped with a single tangential secondary air connection into the blow gas main gave combustion results almost as good as those normally obtained at Brentford, it was decided to accept the simpler arrangement for Beckton.

The maximum operating pressure of shell type boilers is determined mainly by size. Enquiries showed that 300 lb. per sq. in. gauge was likely to be the limit for the boilers required for Beckton. This finding was satisfactory because it would permit integration of the planned steam system with the existing works supply if desired and would make possible a good steam to power conversion factor. The choice of horizontal fire tube boilers was dictated first by the operating pressure and steaming rate and secondly by the desire to avoid the

known defects of the vertical tube design. Superheaters were included primarily to produce good steam conditions for the pass-out turbo-alternator. Because of the cyclic nature of the gasmaking process it was decided to connect the superheaters in the boilers of one pair of sets in series in order to maintain a reasonably steady steam temperature with the sets operating on staggered cycles.

The passage of up-run blue water gas through the waste heat boilers could be justified only on a plant designed for base load production. The waste heat to be so extracted from up-run blue water gas is only about 10% of that to be extracted from the waste gases and the result is to increase the high pressure steam production from 44 to 48 lb. per 1,000 cu.ft. of gas. The passage of gas containing any oil gas through the waste heat boilers is known to produce deposits of tar which bind together with the dust carried by the waste gas. As such deposits accumulate rapidly and can be removed only by burning out, an operation which produces considerable black smoke, it was arranged that the connections for leading blue water gas through the boilers shall be capable of being blanked off when oil is to be used.

Dust emission from water gas plants is generally accepted as being a necessary evil of the process, and the usual arrangement of a dust collector on the top of the waste gas stack after the stack valve is unsatisfactory for many reasons. Some improvement results when the stack valve is provided with a collar joining the chimney outlet to the collector inlet when the valve is open, but the performance of the conventional form of collector is not high when measured in terms of efficiency over the full range of dust particle size. This low efficiency is partly due to a feature of design which compels the concentrated dust to cross the path of the partly cleaned gas, and often the performance is decreased further by the effects of corrosion and the caking of dust.

It was decided to make a new approach to this problem by removing dust from the waste gas before the stack valve and to make provision for the pressure loss necessarily associated with dust removal by inertial force. Many forms and arrangements of dust collectors were examined and it was decided finally to employ one large cyclone collector on each set. The cyclones were designed to collect dust down to 30 microns, with an efficiency of not less than 99% at an overall pressure loss of not more than 2 in. W.G. at the normal rate of air blowing. The outer casings are constructed from mild steel and the centre tube of cast iron, so arranged as to be replaceable. No internal lining was specified, but the casings are lagged overall externally.

Some time before these cyclones were required to operate at Beckton it became possible to examine the performance of an identical cyclone installed at Mill Hill on a new water gas plant of 2.5 mill. cu.ft. per day capacity. Although this cyclone was considerably oversize for the duty our tests showed the need for modifications to the gas inlet and to the gas collecting main in order to reduce the pressure losses. When the effects of these modifications had been proved on this prototype, the design of the cyclone for Beckton was amended accordingly, but after a short period of use it was found that the shell of the prototype cyclone was being worn away very rapidly near the apex of the conical base. Investigations showed that this wastage was due to abrasion by coke particles rotating over the surface of the cone, with the rate of abrasion greatest near the apex, but the wastage of the cylindrical surface was negligible and the centre tube with its gas straightening vanes showed no evidence of abrasion. To cure this trouble a lining of hard blue brick tile was built into the cyclone up to the level of the top of the cone base and the dust discharging procedure was modified so as to ensure that all collected dust flowed into the valve discharge pocket and did not remain in the cone base. However, time could not be spared to examine the effect of the dust on the blue brick lining before making a decision as to what lining was to be used in the cyclones at Beckton, so cast-basalt tiles were specified and installed there. This much cheaper and softer lining has proved to be completely satisfactory.

The collection of dust in a cyclone or similar device located before the stack valve entails removal of the dust from the collector under gas pressure. This problem becomes a particularly difficult one where the gas is at times inflammable and where the dust particles collected are likely to be at red heat. It appeared necessary, therefore, to employ a discharging system which would not require storage of dust in large pockets between the times of plant shut-down for ash discharge and the purging of these pockets before starting up again, and to avoid the nuisances that are usually associated with the handling and transfer of dry dust, particularly on a plant where many tons of dust were to be expected each day. Therefore, after tests had proved that similar dusts, hot or cold, were wetted easily by water, further tests were made to determine the water flow velocity necessary to move wetted masses of dust up and over an inverted U seal.

A prototype hydraulic discharge valve was designed and proved to be capable of handling considerable additions of dust without blocking when flushed intermittently with water. The final form of the valve is shown in Fig. 3. It consists essentially of a receiving chamber 18 in. in diameter and 9 ft. tall with a top inlet for dust and a side tangential inlet for the flushing water. At its base the chamber is connected to a 6 in. diameter seal pipe through a smoothly tapered bend. The seal pipe is arranged at an angle of 45° and discharges into a vertical leg, equipped with a syphon breaking vent, which in turn discharges into an underground flume. The blowing

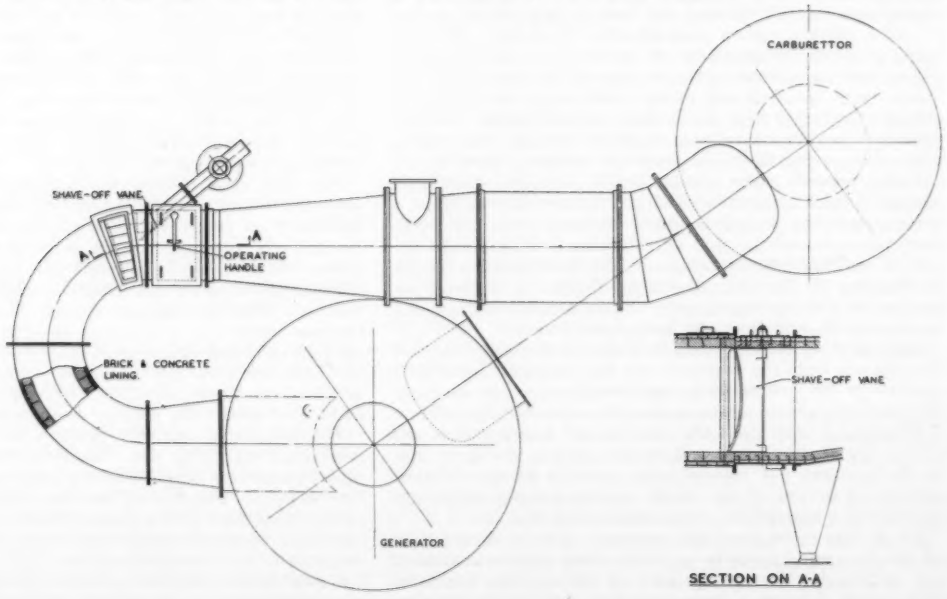

Fig. 2. 'Lion's tail' dust collector.

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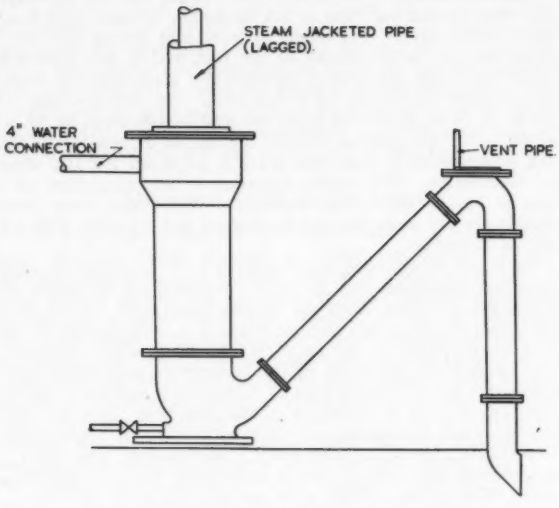

Fig. 3. Dust discharge valve.

pressure of this valve is about 60 in. W.G. Cast iron is used throughout for the construction and has proved to be completely satisfactory. Plugs are provided either for rodding or for hydraulic sluicing in the event of blockage, but their use has been infrequent.

The quantity of water required for flushing a valve is about 100 gal. and this is supplied during a period of about 20 seconds, equivalent to a supply rate of 18,000 gal. per hour. This water supply is controlled by the automatic plant operator so that one flush of 100 gal. is produced during each gas-making cycle. Dust is transferred between the collectors and the discharge valves through steam jacketed discharge pipes which were arranged to be as short and nearly vertical as possible. Blockage of these pipes has occurred only infrequently at times of starting up.

Two underground flumes are provided; one received the water from two lion's tail dust discharging valves and the other the water from four cyclone valves. These flumes are egg-shaped, having a slope of 1 in 48 and discharge into a settling pit all the aqueous effluent from the gas condensing periodically from the settling pit by a grabbing crane and is eventually blended into the coal charged to the coke ovens.

The valve flushing water is recirculated from the settling pit by centrifugal pumps with cast iron casings and impellers and a small head tank is incorporated in the circulating system with overflows into the head of each flume to provide a continuous flush of water. Water losses from the system are made up and a purge is provided by discharging through the settling pit all the aqueous effluent from the gas condensing system. This arrangement has produced an unforeseen advantage by improving considerably the oxygen absorption characteristic of the total plant effluent without adding to the solids content. It is believed that this improvement results from the absorption by the coke dust of some portion of the tar compounds contaminating the water.

Cleaning of Wash Boxes

Mention must be made at this point of the problem of wash box cleaning. The bulk of the solid material which collects in the wash boxes of a water gas set consists of coke dust and the rate of accumulation depends on the rate of carry over of dust from the generator. Gas velocities through the vessels are generally highest during the blow period, and it is probable that most of the dust which enters the wash box is deposited in or near to the inlet of the wash box main during the blow period and is then carried forward by the up-run make gas or by the liquor sprays. On some sets the arrangement of the wash box offtake relative to the waste gas offtake is such as to promote collection of dust in the make gas main when the set is being blown.

The wash boxes of No. 2 plant are elevated above plant floor level and have coned bottoms closed by sludge discharging valves. These valves discharge into an underground flume, similar to the dust-carrying flumes, which leads to a separate settling pit. Solids are grabbed out of this pit periodically and liquids are pumped back to the liquor from tar separators. This method of handling has proved to be satisfactory in every respect. While no accurate measurements have been made it is known that the weight of solid material collected in the wash boxes of this plant is considerably less than on a similarly operated plant in which the coke fed to the generators is not so effectively screened.

All the steam produced by waste heat recovery from gases is passed to a pass-out turbo-alternator. This machine is provided with steam nozzle control and speed governing gear which insures that the machine adjusts itself slowly to the rate of steam supply and is not affected by the small but rapid variations in pressure in each boiler due to the cyclic heat input. The overall effect of this control arrangement, operating over the range of 285 to 295 lb. per sq. in. gauge is to make the waste heat boilers deliver their steam at an essentially steady rate.

Process Steam Pressure

The pass-out pressure of the turbine is 15 lb. per sq. in. gauge, and the working pressure in the process steam supply system is 5 to 7 lb. per sq. in gauge. This low process steam pressure was dictated by the circumstances that a surplus supply of steam at a pressure of about 7 lb. per sq. in gauge was available from the nearby coke oven producer gas plant, and it appeared desirable to make use of this steam on the new water gas plant. The use of this external supply permits a larger proportion of the plant waste heat steam to pass into the condensing stage of the turbo-alternator. Had this supply not existed it is certain that the process steam system would have been designed for a somewhat higher pressure so as to limit the sizes of mains and valves.

Steam passed out from the turbo-alternator, together with the steam from the generator boilers, reduced from 40 to 15 lb. per sq. in. gauge, passes through a pair of Rateau type accumulators. These work at a pressure between 15 to 7 lb. per sq. in. gauge, and serve to smooth out the cyclic demand for steam. This permits the turbo-alternator to pass out steam at a steady rate. The steam accumulators remove any superheat carried by the in-going steam and deliver steam which is generally wet, which has made it necessary to install driers which will be described later.

Electrical Power Plant

The maximum power output of the turbo-alternator is 1,400 kW at 6,600 volts. The plant power system is connected to the works supply which absorbs any surplus power or makes good any deficiency. In order to simplify the problem of establishing and maintaining synchronous parallel operation of this machine with the main works generating plant an asynchronous type of alternator was chosen. This type of machine requires current from the outside supply for its excitation and does not require to be synchronised when being started up. It is essentially self-governing in speed but can give no power if the outside supply of current fails. The machine has a very flat efficiency curve and gives a higher efficiency over a range of 40% to 100% loading than could be obtained from a synchronous type machine. The power factor characteristics are not so favourable, but the effect on the works supply system is negligible. In use this type of alternator has proved to be very satisfactory.

The first set went to work in December, 1951, and was followed by its companion early in February, 1952. Control of the operation was in the hands of the contractors, assisted by the Board's personnel. In this way our first pair of sets were operated from one control cabin, and the best operating conditions to fulfil the anticipated performance figures were arrived at without difficulty. These were based on a nominal capacity of 4.5 mil. cu.ft. per set day of 500 B.Th.U. per cu.ft., purified air-free gas, at a medium blast pressure of 42 in. W.G.

In March, 1952, after a forty-eight hours stabilising period a forty-eight hour performance test was carried out on these two sets.

The remaining two sets were completed and put to work at the end of April and July, 1952, respectively, but the Board's

output could not accommodate a high C.V. output until October of that year, when a similar performance test was carried out on these two sets.

The results of these preliminary performance trials were judged to be encouraging since it was known that optimum conditions of operation had not yet been established. The cycle, which was of 2.42 minutes duration, was split up as 39% blow, 61% run, with 22% back-run; the air stream ratio was 24:1 and steam decomposition was 34% after an allowance for back-run steam remaining in the cracking vessels had been made. These figures become 22:1 and 30% respectively if the total steam consumed is taken. For the test on first pair of sets the back-run steam was 38%, and for that on second pair 45% of the total process steam. With the four sets now in commission the blast pressure was stepped up to 45 in. W.G. and the cycle modified to 44% blow, 56% run with 22% back-run. It was at this stage in November, 1952, that the N.T.G.B. took over the operation of the sets.

Maximum Output Attained

The increase in consumption during the winter months enabled us gradually to step up the plant output to 5.7 mill. cu.ft. per set per day, or 22.8 mill. cu.ft. with all four sets at work. In doing so we had reached the limit of our exhauster capacity, and it was not until this had been modified in the summer of 1953 that in January, 1954, we reached the maximum output with four sets working at 26.5 mill. cu.ft. of gas per day at a C.V. of 474 B.Th.U. per cu.ft., a little over 6.5 mill. cu.ft. per day per set.

The blast pressures employed in achieving these results were 58 in. W.G. for 5.7 mill. cu.ft. and 62 in. W.G. for the 6.5 mill. cu.ft. The air steam ratio was varied from 22:1 to 26:1 and was dependent on the characteristics of the coke, operating conditions, and C.V. of the gas required. The cycle, too, was modified to 42% blow and 58% run with 22 to 24% back-run. The chief factor governing the cycle adopted for the increased outputs quoted has been the retention of a 12% oil clearance between the up-run and back-run so as not to impair the oil efficiency. Advantage has also been taken of the increased output to decrease the steam purge from 6% to 4% so as to retain an inert content of about 15% in the gas after purification.

Table I shows the results of two performance tests which were begun in April, 1953, and are compared with those from three periods of normal operation extending over 18 months.

TABLE I.
PERFORMANCE RESULTS FOR No. 2 PLANT

	Performance Tests 1953		Normal operation		
	No. 1	No. 1	Oct. 1952 to Mar. 1953	Apr. 1953 to Sept. 1953	Oct. 1953 to Mar. 1954
Total make, mill. cu. ft.	160.079	47.288	2550.710	1647.886	2610.726
Make per set per day, mill. cu. ft.	5.865	6.602	5.497	5.738	6.358
Calorific value, B.Th.U. per cu. ft.	483.2	504.2	489.3	440.4	455.2
Inerts, %	12.4	12.9	12.4	14.2	14.9
Coke consumed per 1,000 cu. ft. lb. wet	32.44	31.40	33.50	33.30	32.94
Coke consumed per 1,000 cu. ft. lb. dry	29.84	28.92	30.50	30.70	30.10
B.W.G. therms per ton of coke wet	164.8	164.9	157.4	162.0	158.9
B.W.G. therms per ton of coke dry	179.2	179.0	173.0	175.8	173.8
Ash in coke, %	11.5	11.7	11.3	11.0	10.8
Moisture in coke, %	8.2	7.5	9.0	8.0	8.8
Oil per 1,000 cu. ft., gal.	1.77	2.00	1.89	1.46	1.65
Oil gas, Therms per gal.	1.38	1.37	1.34	1.37	1.34
Oil quality. Valuation No.	75	76	75	75	75
Process details					
Duration of cycle, minutes	2.42	2.42	2.42	2.42	2.42
Oil: steam ratio	30.5:1	32.1:1	25.7:1	23.0:1	24.0:1
Process steam used, lb. per 1,000 cu. ft.	54.8	51.0	54.3	54.3	57.3
Backrun steam, %	41.6	36.5	44.3	44.9	45.2
Steam to set decomposed, %	39.3	35.7	33.6	33.3	35.1
Steam production					
Annular boiler, lb. per 1,000 cu. ft.	20.4	21.0	20.3	20.5	18.8
W.H. boiler, lb. per 1,000 cu. ft.	28.7	31.7	30.5	30.5	28.3
Total, lb. per 1,000 cu. ft.	49.1	52.7	50.8	51.0	47.1

Since the inauguration of the plant, clinker and ash discharge has been carried out once at the beginning of each eight-hour shift. Each set is shut down in turn, and during this shut-down period the conditions of the fuel bed in the generator above the grate cap and in between the grate and the boiler are explored by means of poker rods. An ash coverage of 10 in. to 14 in. above the grate cap and an ash depth of 50 in. to 60 in. in the vertical annulus are aimed at, and while the ash pocket door is open the grate is inspected for any signs of overheating. This whole operation is only equivalent to a loss of 3% to 4% in the total plant operational time, since washboxes are inspected and de-sludged twice a shift with the set in operation.

Back-run steam rates are maintained at a maximum, and since any variations may be made by modifying the length of the backrun period, while the up-run steam rates are set at a maximum and minimum and are adjusted in accordance with the C.V. of gas required, the use of H.C.V. steam when necessary, and the heat requirements of the carburettor and superheater. Generator blast rates are kept at a maximum and vary slightly with any change in resistance of the fuel bed. The set temperatures are maintained as close as possible to: Generator base 100°C., generator top 600°C., carburettor top 800°C., superheater base 800°C., outlet superheater 650°C. to 680°C., outlet W.H. boiler 230°C., grate annulus 300°C. to 400°C.

The low temperature recorded at the generator base is a function of cooling effect of the generator base on the low pressure saturated process steam, though part of the steam condensed is undoubtedly re-evaporated during the back-run but sufficient remains to leave a wet bottom. The steps that have been taken to remedy this by means of water separators on the up-run steam supply and by primary air pre-heaters will be mentioned later. These units have gradually been incorporated in the sets as time and opportunity presented itself, but prior to their installation, generator base conditions were improved by working the maximum backrun consistent with the maintenance of satisfactory ash discharge conditions. Any attempt to exceed a base temperature at the end of the backrun of over 100°C. caused the formation of heavy clinker and upset steady operation conditions.

The introduction of the pre-heated air to the generator base now gives us a base temperature of 140°C. to 150°C. and a dry dusty extraction of ash. It has, however, caused a small reduction in the rate of air supply to the generator, and together with the loss of indirect H.C.V. steam by evaporation from the wet generator base, has made it necessary to increase the blow period to 46% to maintain the necessary carburettor and superheater temperatures when producing gas of 500 B.Th.U. per cu.ft.

The Second New Water Gas Plant

The conception of Beckton's second new plant, which was to become the No. 3 water gas plant, was quite different from that of the No. 2 plant. It was required to produce up to 18 mill. cu.ft. per day of carburetted water gas of a C.V. of 520 B.Th.U. per cu.ft. to meet seasonal load demands. The planning of the plant started some five years after that of No. 2 plant and in that time further progress towards increased outputs from the dry seal generator plant at Brentford, indicated that it should be easily possible to obtain six mill. cu.ft. per day and more from a generator of 10 ft. to 11 ft. internal diameter. In fact, it seemed, if need be, that two mill. cu.ft. per day could be obtained from units equipped with generators of about 11 ft. diameter under optimum conditions of operation.

From the point of view of capital cost, large capacity units were attractive and allowed a design incorporating not more than three such units. Units of six or even of nine mill. cu.ft. per day capacity could be accepted at Beckton where increments of such sizes would be small in relation to the total load. Steam and power balances for three- and two-unit plants showed that the two-unit design has an appreciable advantage. However, it was finally decided that an increase from four-and-a-half to nine mill. cu.ft. per day unit capacity represented too great a risk, especially in the design of the large carburettors and superheaters which would be involved. The efficiency of oil to gas conversion in such large vessels must not be less to any appreciable extent than the high efficiency which was then being achieved in the smaller vessels at Brentford.

A plant to be made up of three units was, therefore, specified, with each unit capable of producing six mill. cu.ft. per day

of a gas of 520 B.Th.U. per cu.ft. when using gas oil for enrichment. The use of heavy oil in place of the gas oil was seriously considered, but it was decided that it was not likely to provide any considerable economy in gas production, but certainly to limit the thermal output and cause difficulties both in gas cooling and in the separation of tar from liquor. The Specification accordingly covered only certain minimum provisions for the future use of heavy oil.

Alternative Steam Supply System

The integrated steam power system based on the use of back pressure steam turbines to drive the larger of the ancillary machines, was simpler than that designed for No. 2 plant and as it was less expensive in capital costs, was more suitable for a plant which was expected to have a relatively low load factor. A conventional steam accumulator link-up was employed. As two air blowers were specified, each capable of operating two sets up to the maximum limit of gas output, it would be necessary to operate both blowers when all three units were working to produce 18 mill. cu.ft. and more of gas. Although this arrangement involves some unnecessary consumption of high pressure steam by the blower turbines this steam can be generally absorbed in the process. Both turbines are equipped with steam nozzle control devices which have the effect of reducing steam consumptions when the blowers are not delivering air, and it is possible, under conditions of reduced gas output, or when making low C.V. gas, to operate the three sets from one air blower by modifying the blowing period on each set to less than 33% of the cycle.

Certain of the other special design features of No. 2 plant were included in the specification for No. 3 plant, but others were excluded either because they were not suitable for a plant which was only to produce carburetted water gas or because the proposed load factor did not justify extra capital cost.

The Power-Gas Corporation was entrusted with the design and erection of this plant and they introduced to us certain features of design which at that time were new in this country. After careful consideration, we decided that these should be included in this very large plant. The most important of these new design features was the reverse flow carburettor which had been developed by the Semet Solvay Corporation in the United States, and comprises an empty vessel into the base of which the gases enter tangentially and into the top of which the oil is sprayed against the direction of gas flow, while a throat at about the mid-height of the carburettor is designed to promote a turbulence and mixing of the gas with the oil vapours. A few smaller carburettors of this type were operating in this country at the time, but their possibilities and performances had not then been completely explored. This design had the great advantage of being able to gasify heavy oil without carbon accumulations and as the bottom chamber of the carburettor would function as an efficient dust trap some of the dust from the generator would be prevented from going forward through the plant.

We decided to install the Semet Solvay 3-way back run valve to control the flow of make-gases at the inlet of the washbox but only after satisfying ourselves that the working faces would not deteriorate by a combination of liquor spraying and high gas temperatures. We insisted however that the valve bodies, seats and discs were made throughout of stainless steel.

The generators chosen for the plant are of 11 ft. 6 in. internal diameter and are equipped with Power Gas eccentric grates. Each grate is driven by a twin set of hydraulically-operated ratchet drives enclosed in the generator base. These drives, which are diametrically opposite each other, can be operated independently in case of failure of either one. The rate of grate rotation is controlled by the number of strokes per unit of time and provision is made for reversal of its direction, and each generator has its own Lockheed oil hydraulic power unit.

The first of the sets started making water gas in September, 1954, and the others followed at intervals of about two months. These sets required a different operating technique to those of No. 2 plant and this had to be learned by trial and error, but as soon as the plant performance had become reasonably stable the first of a planned series of performance trials was carried out by members of the Research Department staff. The plant operating conditions for this trial were set deliberately to restrict the rate of gas production to about 6 mill. cu.ft. per day from each generator, since this rate was the basis of the design. Coke made from Durham coals in static carbonising plants was used in the generators and gas oil of standard quality in the carburettors. The cycle adopted was of four minutes duration and split up into 31.3% blow, 51.2% up-run and 17.5% back-run. A steam purge of 5% was included in the up-run period and the oiling period was 29.2% with an oil clearance of 13.4%.

The results of the seven-day trial showed that in spite of the failure of one steam meter during the test the plant is very nearly self-sufficient in steam production and consumption. Further trials are planned for the maximum rate of gas output with heavy oil in place of gas oil.

After the test had been completed the plant output was increased. A cycle of three minutes was adopted and split up into 35.0% blow, 45.0% up-run and 20.0% back-run. The steam purge remained at 5% and the oiling period was shortened to 24.5% with a 10.0% oil clearance, with an increase in the make per set day to some 8.0 mill. cu.ft.

In February, 1956, the output was increased to 9.0 mill. cu.ft. per day. The three minute cycle remained but was split up into 36.5% blow, 43.5% up-run and 20% back-run, while the steam purge was reduced to 4.0% and the oiling period increased to 27.0% with an 8.0% oil clearance.

The monthly results obtained during this period when the output of the plant was being worked up are shown in Table 2. The results for November cover those of the performance trial which was carried out in that month. The sets operated throughout November with a four minute cycle and a make per set day of about 6.25 mill. cu.ft. In January when the cycle time was shortened to three minutes the make increased to above 8 mill. cu.ft., per set per day and in February it increased to 9 mill. cu.ft. These increases in output were obtained without any appreciable variations in coke and oil gasification efficiencies which are as good as any results obtained before on smaller sets.

TABLE 2
PERFORMANCE RESULTS FOR No. 3 PLANT

	Nov., 1955	Jan., 1956	Feb., 1956
Total make, mill. cu. ft.	485.526	628.776	738.003
Make per set per day, mill. cu. ft.	6.260	8.134	9.050
Calorific value, B.Th.U. per cu. ft.	49.1	468.9	487.5
Inerts, %	16.7	16.1	15.6
Coke per 1,000 cu. ft., lb. wet	31.54	32.90	32.47
Coke per 1,000 cu. ft., lb. dry	29.1	29.64	28.87
B.W.G. therms per ton coke, wet	155.8	155.8	155.2
B.W.G. therms per ton coke, dry	168.7	172.9	174.5
Ash in coke, %	10.3	10.4	12.2
Moisture in coke, %	7.6	9.9	11.1
Oil per 1,000 cu. ft., gal.	1.97	1.69	1.90
Oil gas therms per gal.	1.37	1.42	1.38
Oil quality. Valuation No.	75	76	75

Performance of Dust Collecting Equipment

When No. 2 plant had worked for some time a series of efficiency tests was carried out on the 'lion's tail' and cyclone dust collectors under conditions of maximum gas load. For these tests the automatic wetting and discharging valves were not operated because it was desired to collect the dust in a dry condition. The total quantity of dust collected per day from the four sets when operating to give maximum thermal output is about ten tons, and there is evidence to show that the overall efficiency of dust collection on the two sets not equipped with catchers between the generators and carburettors is not quite so good as on the sets that are so equipped. The explanation is that when more dust passes forward through the carburettor it suffers further size reduction by abrasion and combustion in the vessels and mains before the stack valve so that the effectiveness of the cyclones is reduced.

In assessing the performance of the 'lion's tail' collectors there are two factors to be considered, first the amount and nature of the material collected that would otherwise have passed into the carburettor and second the resistance to flow caused by the duct and shave-off. The weight of dust collected is about 0.4 tons per day per set, including sometimes with the coarsest material lumps up to 3 in. in diameter. Measurements of pressure loss and comparisons of pressure conditions between sets with and without the 'lion's tail' device showed that when the shave-off blade is set correctly for maximum

dust collecting efficiency the device adds approximately 2 in. W.G. to the total back pressure of the set during the blowing period. Because of the proximity of the secondary air inlet to the shave-off blade it has not been practicable to sample the gas leaving the 'lion's tail' and so to determine the effectiveness of dust removal.

Although the 'lion's tail' collectors have generally given a satisfactory performance, maintenance costs have been heavy. The causes for this were, first, blockages of the shave-off apertures caused by lumps of coke too large to pass through and, secondly, breakdown of the refractory linings round the inlets where gas conditions are worst. This last difficulty was foreseen at the design stage but so far no complete solution has been found. These difficulties have involved appreciable losses of gasmaking time and some reduction in the general reliability of the sets so it has been decided to remove these collectors. Since dust collection immediately after the generators is desirable, we shall attempt to produce an improved design when the opportunity occurs.

As well as weighing the dust collected in the cyclones, the pressure loss and efficiency of collection were also investigated. The pressure loss ranges from 2.33 in. W.G. at a total blowing rate of 17,400 cu.ft. per minute to 4.6 in. W.G. at 25,000 cu.ft. per minute. Since the cross section of the ducts at the outlets of the waste heat boilers and the inlets to the stacks, where the differential pressures had to be measured were not the same, these pressures do not represent true frictional losses but include some recoverable kinetic energy. The pressure losses corrected for this effect ranged from 1.9 in. at the lower rate of blowing to 3.75 in. at the highest.

The efficiency of recovery of dust was estimated by measuring the dust collected simultaneously with that leaving the outlet of a cyclone.

The efficiency of dust collecting in the No. 2 plant may be compared with the No. 3 plant which is fitted with the checkerless regenerator, and vortex-type dust collectors before the chimney stack. These comparisons are shown in Table 3.

TABLE 3
PERFORMANCE OF DUST COLLECTORS

	No. 2 Plant		No. 3 Plant
Total air rate, cu. ft. per min.	22,000	.. ..	27,500
Dust collected, lb. per day:			
Lion's tail ..	648	Carburettor	1,618
Cyclone ..	2,360	Vortex ..	527
Total ..	3,008		2,145

There is a very much higher proportion of very fine dust discharged from No. 3 plant and the presence of this small material affects adversely the efficiency of its removal. An analysis of all the data available from these tests shows that the efficiency of the vortex collectors if presented with dust of the same size distribution as that entering the cyclones on No. 2 plant would be 81% as compared with 86% for the cyclones. Despite the somewhat lower efficiency of the vortex collectors, the total quantity of dust discharged to atmosphere from No. 3 plant is no greater than that discharged from No. 2 plant, but the dust is generally smaller in particle size.

The much larger proportion of fine dust in the waste gas from No. 3 plant is caused by the abrasion effect of the continued circulation of the dust in the bases of the carburettors, as was shown by the dust escaping from the stacks when the carburettors were emptied once every eight hours. Then it contained 42.8% of particles below 40 micron size but when the carburettors were emptied every 24 hours the proportion below 40 micron size increased to 64%. For this reason it has been decided to arrange for the continuous discharging of dust from the carburettors by hydraulic valves similar to those on No. 2 plant, since it is believed that when this change has been made the quantity of dust emitted from No. 3 plant will become exceptionally small.

These tests show that both the cyclone and vortex collectors as installed on these new large plants are very satisfactory for their particular duties. The vortex collectors are slightly less efficient than the cyclones but they offer less resistance to gas flow. The removal of dust from the blow gases immediately after the generator will reduce the quantity to be passed on to the final collector and improve the efficiency of its removal at that point. The up-flow type of carburettor with a tangential inlet was found to be a most efficient dust collector provided the dust is removed from it continuously.

The dry seal generator is usually dry in name only and appreciable volumes of condensate form on the internal surfaces of the generator grate housing to which steam and gas have access either during the up-run or back-run periods of the cycle. This condensate is always liable to be acidic and when it is formed on surfaces which are subjected to abrasion the rate of wastage of the metal can be very rapid. The loss of process steam, too, may be appreciable. The temperature of this part of the generator shell is determined by the quantity of heat it receives by conduction from the jacket boiler and from the grate and by the temperatures of the air, steam and gas flowing in and out. Generally much of the generator base surface is below 100°C. and is therefore likely to condense any steam which contacts it. Lagging the external surfaces of the base does not correct this trouble because the heat lost to the atmosphere is small compared with that lost to the blowing air. This can be most serious when the process steam is supplied at low pressure from an accumulator system because then it is at a low temperature and is wet. This condition obtains on No. 2 plant especially when, in order to balance the steam systems, the jacket boiler steam is added to the pass-out steam before the accumulators. A marked improvement in generator base dryness results when the jacket boiler steam can be admitted directly to the process supply system after the accumulators. The generators of No. 3 plant are not so seriously affected because the accumulators are on a spur connection and receive only that portion of the back pressure turbine exhaust which has to be stored temporarily.

Drying of the Up-run Steam

To correct this condition several methods have been considered. Drying the process steam by direct or indirect heating with high pressure steam is practicable but wasteful of steam, and any appreciable degree of superheating of the process steam might be dangerous with a mains system constructed of cast iron. Steam treatment was, therefore, limited to the drying of the up-run steam by means of a water separator and to rely on air pre-heating to maintain a safe temperature at the base of the generator. To insert a water separator into the up-run steam main after the control valves was a formidable task and several commercial designs of water separators were examined and rejected either because of size and weight or because the pressure drop required was too high. Finally the design shown in Fig. 4 was evolved capable of removing 99% of all water drops above 1/300 in. diameter when passing steam at the rate of 450 lb. per minute at 7 lb. per sq. in. gauge with

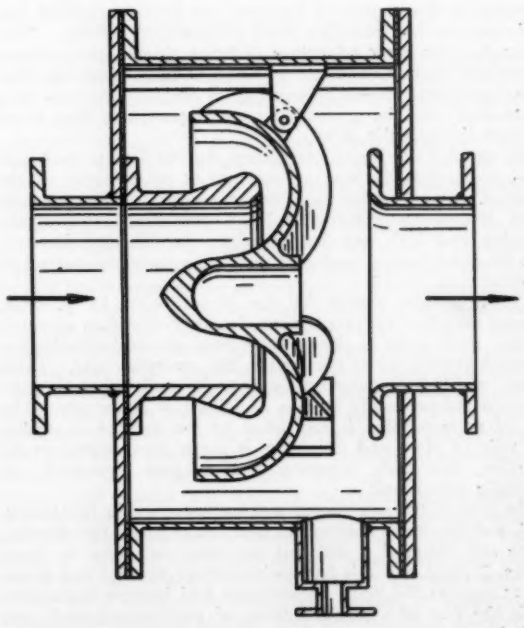

Fig. 4. Dryer for process steam.

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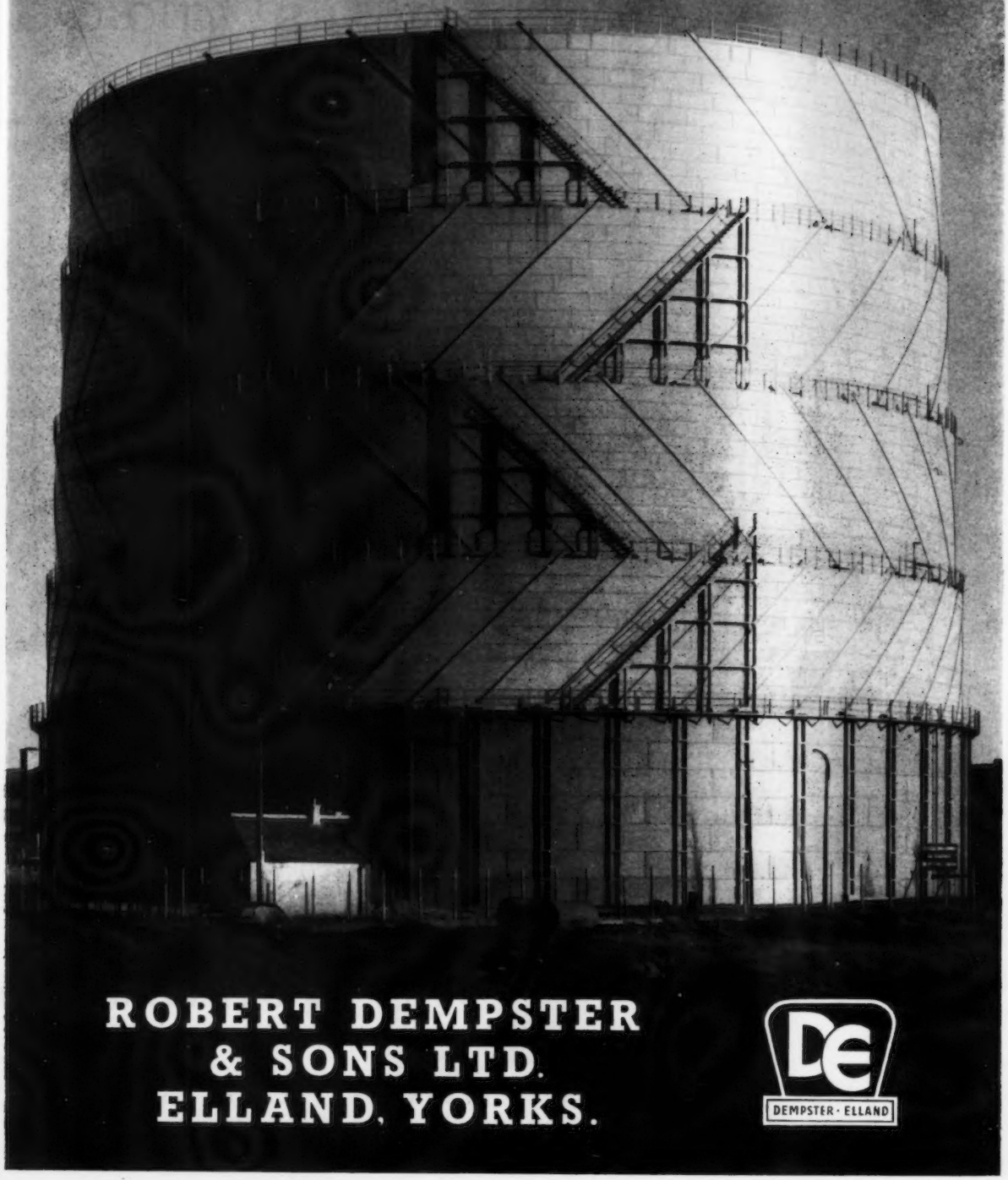

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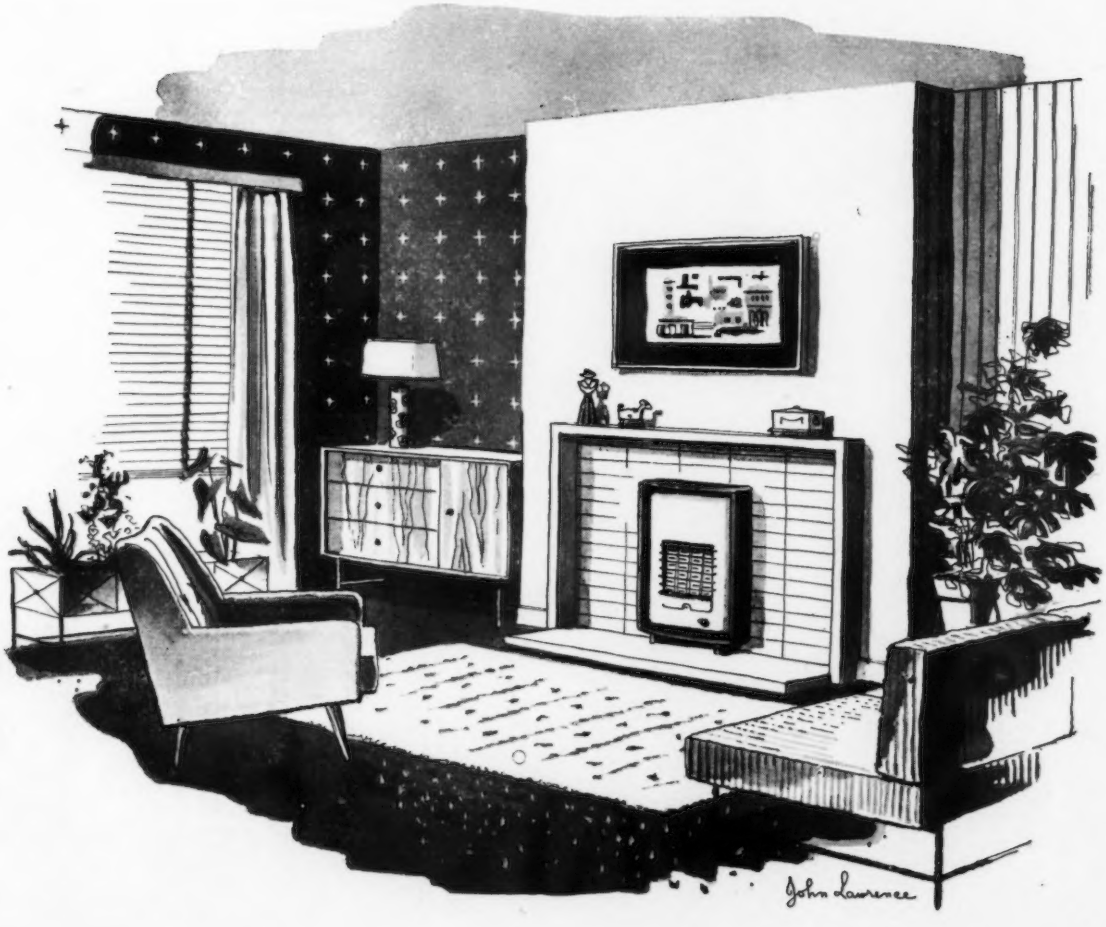

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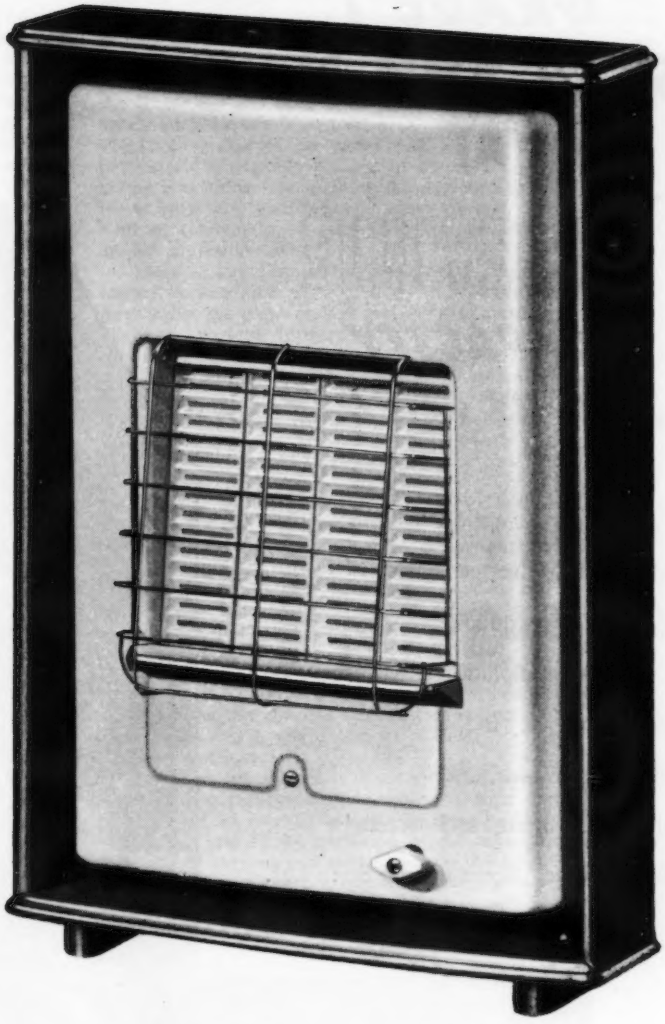

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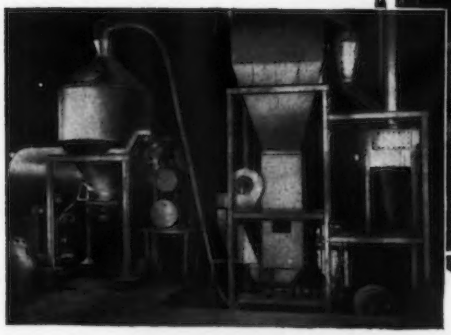

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a pressure loss of only 0.75 lb. per sq. in. Four of these separators have been installed on No. 2 plant.

Consideration had been given at the time of preparing the specification for No. 2 plant to the possibility of air preheating by waste heat as a means of improving the overall thermal efficiency of coke gasification but it was rejected in favour of the existing waste heat steam and integrated power system. The preheat requirements for maintaining a dry generator base are quite different and air preheating by steam to only just above 100°C. was judged to be sufficient, in association with dry up-run steam. About 1,800 cu.ft. of primary air are required for each 1,000 cu.ft. of carburetted water gas made and to heat that quantity of air from 50° to 240°F. requires a heat input of 6,300 B.Th.U. This quantity of heat, if it reached the fuel bed without depletion, would produce a saving of about 0.5 lb. of coke per 1,000 cu.ft. of gas. The purpose of such limited preheating is, however, primarily to reduce maintenance costs and process steam losses.

Since the blowing period of a normal water gas operating cycle never exceeds 50% of the whole, one air preheater can serve two sets supplied with air from one blower. This is the arrangement adopted at Brentford where a similar problem existed with dry seal generators. On No. 2 plant at Beckton, however, it was found impracticable to locate a heater in the existing outlet air blower main before it branches to the sets which form two pairs and so four heaters had to be installed, one to each generator. These heaters consisted of gilled steam tube assemblies each containing about 2,600 sq.ft. of total surface for heat transfer. The pressure drop produced is about 1.25 in. W.G. at the maximum rate of air flow and the temperature of the air leaving is 240°F.

DISCUSSION

Dr. J. Burns, G.M., Chief Engineer, North Thames Gas Board, said: 'The story of carburetted water gas in the North Thames Gas Board goes back a long way and the history is as long as any in this country, but we reached a stage during the war when it became necessary to look forward and to attempt to determine the form which our gasmaking plant should take. The history of the developments of our conceptions of seasonal and peak loads is probably too well known to describe here in greater detail, but all our considerations at that time pointed to the suitability of carburetted water gas to assist in meeting the new seasonal loads which we expected in the post-war era. We had three very solid grounds on which to base all our new designs; first, the long experience of carburetted water gas manufacture in the Gas Light and Coke Company; secondly, our particular experience on carburetted water gas manufacture in the Brentford sets of the Gas Light and Coke Company, and thirdly the splendid theoretical and practical assessment of the chemical reactions inherent in the carburetted water gas process carried out by Dr. Dent.

'This work was initiated when Mr. Birks was Chief Engineer of the Gas Light and Coke Company and was prosecuted with great vigour until finally in December, 1951, the first gas was made on the new Humphreys & Glasgow carburetted water gas plant at Beckton. The full details of the operation of this plant are already set out in the paper before you today, but I would draw attention to two outstanding points: the very high efficiency of operation and the very large output which is being obtained from these sets. Then came the necessity to expand our plant for seasonal load manufacture and we were then so very much aware of the potentialities of what the first plant would make that he had no hesitation in designing the second plant for a bigger output. In fact, I can remember very well the challenge put to me as Chief Engineer by Mr. Birks, then Deputy Chairman of the Board, that we should design for outputs even bigger than 9 mill. cu.ft. per set, but I was at that time worried about oil efficiency in particular and was not prepared to accept the challenge, but recommended that we go ahead with the design of a plant with a nominal installed capacity of 6 mill. cu.ft. per day, from which we hoped to produce 9 mill. cu.ft. The building of this plant, as you know, was entrusted to the Power-Gas Corporation and we now have at Beckton two plants side by side—one built by Humphreys & Glasgow, Ltd., and the other by the Power-Gas Corporation, Ltd.

'So much for the history and the technical aspects of these plants at Beckton, but where do they stand now on the economic scale in comparison with other processes? It is, of course, well known that the comparative economics of any gasmaking process are primarily a function of the raw materials today, and since these particular plants were erected we have come to experience oil gasification processes such as the Segas and the Onia-Gegi and both these processes have received a nasty knock with the increase in oil prices following the Suez crisis. The capital charges on plants like the Beckton plants are particularly favourable because of the very high outputs and, taking everything into account, they amount to only 0.8d. per therm on a 90% load factor at today's prices. This compares with approximately 1d. per therm for the capital charges in an oil gasification unit.

'There is, therefore, at the present time very little difference indeed between the costs of making seasonal load gas on a large water gas plant and on oil gasification unit, but we have, obviously, to look forward to developments in the technique of oil gasification by catalytic processes on similar lines to the developments which have already been undertaken in the industry on carburetted water gas manufacture.'

Mr. I. H. Phillips, Humphreys & Glasgow, Ltd., said that as Dr. Spivey and Mr. Williamson had described it, the No. 2 plant at Beckton had incorporated many new ideas, some of which were novel indeed. He went on: 'The subject, which I would like to discuss further now, covers both overall steam consumption and the effect of using wet steam. In any water gas generator, there is of course a hot zone in the fire in which the greater part of the gasmaking reaction takes place and, beneath this, there is always a zone of ash sandwiched between the hot zone and the base of the generator. While everyone is, no doubt, aware of this, I do not think that the implications of it are so widely understood. This ash zone functions as a heat regenerator and throughout the cyclic process it is continually being heated up and cooled down again. Now the effective size of this regenerator is of great importance and I would like to consider, therefore, the two possible extremes.

'If on the other hand it is a very small thin zone, it is, in fact, a very ineffective regenerator. During the blow, this zone would, of course, take up the temperature of the atmospheric air and at the beginning of the subsequent up-run it would tend to cool and even condense the up-run steam but, in that it was so small, it would not be able to achieve much. On the subsequent back-run likewise it would not be able to do much cooling of the back-run gases and, accordingly, they would go away extremely hot. There would be no question of corrosive conditions arising at the generator base; the problem would be that it would get so hot that it would be damaged by the heat. Likewise there would be an additional heat loss from the plant which would be reflected in an increased coke consumption.

'Now let us, on the other hand, assume that the ash zone is very, very large. Again, starting with the blow, the lower part of the zone would be cooled off to air temperature, but this time because of its depth and heat capacity the up-run steam would have a very difficult job to get through to the fire. Something like 20% of it or more could easily be condensed en route. Likewise on the back-run, the back-run gases leaving the hot zone would have to traverse this large cold and wet regenerator and they would be so completely cooled off by it that their temperature would never be able to exceed boiling point.

'This is the real problem which arises in the design of dry seal generators and their grates. The difficulty is that the base of the dry generator is more vulnerable to heat than the base of a wet seal generator and consequently a deeper ash zone has to be carried for protection. You will have noticed that the authors give in their paper a normal ash depth in the generator annulus of as much as 50-60 in. with an ash coverage over the grate cap of 10.14 in. While it is, of course, not fair to make a direct comparison, these figures are very much higher than would obtain in a wet seal generator and consequently—diameter for diameter—a dry seal generator contains a much greater volume of ash and hence a much more effective heat regenerator.

'As has been recorded, this gives rise to all the symptoms suggested above, that is condensation of up-run steam and low back-run gas temperature.'

Mr. Phillips said that a large part of the up-run steam,

which was condensed in the ash zone, never got through the fire at all. It was picked up on the subsequent back-run and taken straight to the washer so the whole effect just became a very expensive way of cooling the back-run gases and providing corrosive conditions at the generator base. It was, in fact, similar in many ways to the famous 'missing quantity' in a reciprocating steam engine.

An ash zone of the correct size was a good and necessary thing. It extracted useful heat from the back-run and returned it to the air supply on the blow. If it was too large, however, condensation began to occur. To improve matters, everything possible should be done to reduce such excessive volume and one of the ways of tackling this was to provide a grate with a greater diameter than was usual with the Haug Design. 'Personally, I think this is the right course and it is the normal approach of my Company but there are definite limits as to what can be done because you cannot afford to make the annulus too small.'

Another approach, which was the one which warmed the heart of Dr. Spivey and Mr. Williamson, was to make more gas because doubling the expected make per cycle had the same effect as halving the volume of the ash zone.

Referring to the results in Table 2 for the No. 2 plant, it would be seen that when the highest output was obtained, the consumption of process steam was at its lowest, which was no doubt due to less of the up-run steam, being condensed. This point was quite easy to check by anyone who had a wet seal generator on their works.

Misleading Figure

One small point which arose out of this question of condensation of up-run steam, continued Mr. Phillips, was that the calculated percentage back-run became a somewhat misleading figure. For it to be comparable with normal operating results, allowance should be made for the fact that not all the steam supplied had in fact gone through the fire, *i.e.*, the effective back-run proportion was greater than that indicated.

Another consequence was that purging of blow gases from the set at the end of the blow period was very slow because it was the first part of the up-run which was most subject to condensation. At normal throughputs, the closing of the stack valve had to be delayed considerably if the inert content of the gas was to be kept down. Here again, increasing the make per cycle helped. He continued: 'Before the decision was taken to experiment with blast pre-heating, we devised a number of novel tests to establish the extent of condensation and the most significant of these was a measurement of the differential pressure across the fire during the up-run. With a constant steam meter reading, one would expect this to be virtually steady but in fact it was not. It started at a very low figure and did not reach its full level until well towards the end of the up-run period.

'In the same connection, the authors have referred to the question of wetness of steam and have shown us the design of the separator which has been installed. Obviously, the presence of water particles must tend to keep down the temperature of the generator base and ash zone and consequently tend towards corrosive conditions, but one would not expect it to have any noticeable effect on the operating conditions of the plant. It would be interesting to know what quantity of moisture these separators have in fact removed and whether this has in any way affected the operating conditions.

'In referring to this question of moisture the authors suggest that the "straight through" design of the accumulators is partly responsible for the high water content of the steam. They tell us that this is not so noticeable on the No. 3 plant where it was possible to use a spur connected arrangement. There may be something in this but, at first sight, I cannot quite understand it and I have a feeling that the reason may be slightly different. My recollection of the operation of the steam accumulators on the No. 2 plant was that in fact the water level in them tended to rise and it was always necessary to run some water to drain. It would seem, therefore, that the accumulators were not adding to the moisture content, but I agree that this is an inconclusive argument because of the extra heat losing surfaces involved, but the vessels were efficiently lagged and I cannot see how they can really be responsible for this additional moisture. There are, however, two other points of difference between the two installations, which might be the cause.

'First, it may well be that the large turbine of the turbo-alternator of No. 2 plant is a more efficient machine than the small individual turbines on the machines of No. 3 plant, so that the steam starts off wetter at the pass-out point, and secondly, the steam mains on the No. 2 plant were designed on the basis of very low steam velocities so that they may be relatively larger than those on No. 3 plant, and would, therefore, give rise to higher heat losses.

Mr. Phillips concluded: 'Finally, I would ask the authors whether they would give us for the No. 3 plant a typical set of temperatures corresponding to that given for the No. 2 plant. I presume that the low back-run steam temperature applies here also. I think there must be a misprint in the temperature given for the outlet of the waste heat boiler as this is given as being 230°C., i.e., just under 450°F. The saturation temperature of the steam at boiler pressure is 420°F. and, although I know we design efficient boilers, I do not believe they really are as efficient as that! I suspect that the intended figure was 280°C.'

Dr. R. Lessing, President of the Smoke Abatement Society, asked if there had been a chemical analysis of the dust collected. It seemed to him that this was a most wonderful opportunity of testing one point—that was what this particular dust represented. To a certain extent it must have been caused by abrasion, but he thought there was much more behind it. He believed that at least some of the dust, possibly a major portion, was due to the natural dust in the coal. Under the conditions in which coal was prepared today much of the original dust was left behind.

'I wonder whether the research department of the North Thames Gas Board would not undertake this very simple labour in taking the dust from the various points in different sizes, analysing each size and making an analysis of the ash it contains.'

Mr. D. R. Coote, N.T.G.B., Beckton Gasworks, welcomed the opportunity of presenting the views of the plant engineer to all plant designers. The increase in output of each plant from 18 to 27 mill. cu.ft. per day had been made possible by the generous plant design, but there were nevertheless certain shortcomings which perhaps could have been avoided.

He congratulated the designers for producing such fine de-breezing screens, easily-sludged washboxes, and excellent dust extraction systems. The Castell interlocks incorporated in the automatic operators, and the relief-holder control and alarm system were also most satisfactory.

He was sorry, however, that so few isolating valves had been provided on the steam systems, and that on some of the boilers reliance had to be placed on single blow-down valves. More attention could also have been paid to plant drainage, particularly from the exhausters. He deplored the insufficient provision made for easy renewal of chequer-bricks, easy isolation of the sets by insertion of discs, and safe access to blast canvasses. Plant instrumentation was undoubtedly of a very high order, but such items as access to oil meters, satisfactory running of pressure-gauge services, facilities for sounding the depth of ash in the clinker pockets, and adjustment of the coke charge had often been given insufficient thought. Likewise there was sometimes a lack of liaison between designer, erector and instrument manufacturer concerning the correct installation of instruments. The provision of distant-reading boiler water level gauges, he felt, should also receive more consideration.

Although the ancillary plants had also been generously designed, the capacity of the tar and liquor separators left rather too small a margin for comfortable operation.

Mr. L. J. Clark, B.E.M., Development Engineer, North Thames Gas Board, said: 'I would like to enlarge on just two aspects of this excellent paper dealing with developments on the water gas plants at Beckton.

Electrical Supply to Auxiliaries

'Mr. Williamson has indicated that the steam and power systems of the two plants are rather different. No. 2 plant has one large pass-out turbo alternator which receives all the steam from the waste heat boilers and supplies the process requirements with a small surplus exhausting to a condenser. The electrical output from the machine supplies all the auxiliaries, including the blowers, exhausters, pumps, etc.

'In the case of No. 3 plant, the steam from the waste heat boilers is expanded through a number of turbines driving the blowers, exhausters and some pumps, the exhaust steam being

supplied direct to the process. The reason for adopting these two designs was that when the two plants were first planned it was intended that No. 2 plant should operate on base load, while No. 3 plant would be required for seasonal load working at a lower load factor. No. 2 plant was, therefore, designed to give the highest possible efficiency at the expense of greater capital cost, while on the No. 3 plant we were prepared to sacrifice some efficiency for a lower capital cost in view of the higher standing charges per therm of gas produced from this plant.

Pre-heating Blast Air

'My second point concerns the question of pre-heating the blast air. The paper describes the method of steam pre-heating adopted to prevent excessive condensation at the base of the generators of No. 2 plant and at the same time slightly to improve the steam consumption and fuel efficiency. The effects of this condensation and the mechanism of the heat exchange in the ash zone have been enlarged upon by Mr. Phillips, and it would appear that there is a good case for blast pre-heating. I suggest that this operation could more effectively be achieved by installing a gas turbine to provide electricity and the source of pre-heat.

'It so happens for a plant of the size of No. 3 installation at Beckton that the standard Ruston TA gas turbine suits the installaiton very well. Such a machine would give an electrical output of 800-900 kW, and the exhaust gases from the turbine at a temperature of 850°F. would be passed to a Lungstrom regenerative type of rotary heat exchanger thereby giving up its heat to the blast air and raising its temperature to something in the region of 350°-400°F., such a temperature being considered quite safe for the mechanical parts of the rotating grate. The regenerative type of heat exchanger has advantages, in this case as it has thermal inertia and can store heat during the idle periods of the blowing cycle. The Ruston TA turbine is of sound and proved design and there are many machines now in operation. The fuel for the turbine would be oil gas tar and the normal quantity produced by the C.W.G. plant would be more than adequate for this purpose. Tests have also been done with this fuel in a gas turbine combustion rig, and it can be stated that it is suitable for this type of machine.

'On the economic side it can be shown that if all the capital charges, i.e., interest and automisation on the installation involving some £55,000 of capital outlay and the operating expenses for fuel, attendance and maintenance were charged against the electricity production only, the cost of such electricity would amount to approximately 1½d. a unit. This is equivalent to the average cost of purchased electricity from the public supply. In addition to electrical output, however, some 80% of the heat in the tar passes out to the exhaust of the turbine and a large proportion of that heat is transferred to the blast air in the heat exchanger. Dr. Spivey has indicated that the fuel saving for the steam heated blast at a temperature of 240°F. was likely to be about 0.5 lb. per 1,000 cu.ft. With the considerably higher blast temperatures possible with the gas turbine a saving of about 1.0 lb. of coke per 1,000 cu.ft. should be possible, and although this appears to be small, it does represent a saving of over £10,000 per annum in coke usage with the plant operating at 50% load. In addition there would be a saving in steam to process as the "missing" quantity referred to by Mr. Phillips would be avoided. Dr. Spivey has indicated that a reduction in steam consumption around 5 lb. per 1,000 cu.ft. might be expected and this, again, represents an annual saving of around £8,000. It may also be expected that the maintenance costs on the grates of the water gas sets would be reduced by the avoidance of condensation.

The authors, in a written reply to the discussion, said:—

Dr. Burns has drawn attention to the favourable capital charges which are now associated with these large water gas plants. Their reliability of operation is one important factor which contributes to their very high gas outputs.

Mr. Phillips refers to the considerable depth of the ash bed which we maintain on the Haug pattern grates in the generators of No. 2 plant, and he argues that this ash-bed acting as a heat regenerator produces condensation of some appreciable portion of the up-run steam and lowers the temperature of the back-run gases to near steam condensing temperature. It is agreed that some heat exchange does occur in this zone of the generator but not to the extent which the figures of ash depth might appear to imply. We know that the flow of gases through a Haug grate carrying a deep ash bed is confined essentially to the top section of the grate ring assembly where the ash cover is not more than 18 in. in thickness. The ash bed below the level of gas passage cannot, therefore, function effectively to regenerate heat but it does, undoubtedly, condense some small portions of the up-run and undecomposed back-run steam which flow over it. It also insulates the base of the grate from the fire zone and so produces conditions conducive to wetness and corrosion. Experience on similar generators with larger diameter grates does not appear to support Mr. Phillips' argument that a reduction of the annulus width between the grate and generator shell produces any appreciable decrease in the steam lost by condensation in the ash bed.

The primary purpose of the air preheaters now installed on No. 2 plant is to produce dry conditions in the generator bases. The consumption of high pressure steam for this limited air preheating is about 6 lb. per 1,000 cu.ft. of gas made, but 1 lb. of low pressure steam is recovered by flashing the condensate. Some small saving in coke consumption is also anticipated. The presence of water in the process steam drawn from the accumulators was proved before we decided to install separators in the up-run steam supply lines. Since this paper was written more experience has been gained in operating with preheated air, and the output from each of the 9 ft. diameter generators of No. 2 plant has now increased to 7.75 mill. cu.ft. per day with coke and oil gasification efficiencies maintained at the high levels shown in the tables.

The figures requested by Mr. Phillips for typical operating temperatures on No. 3 plant are as follows:—

Generator base	100°C.
Generator top	630°
Carburettor base	830°
Carburettor top	780°
Superheater top	880°
Superheater base	760°
Outlet W.H. boiler	260°
Grate annulus	140°

Because of different arrangement of the connections between the vessels and other design differences on No. 3 plant compared with No. 2, these temperatures are not all strictly comparable with those recorded in the paper.

A correction must be made to the figure given on page 11 of the paper for the outlet W.H. boiler temperature on No. 2 plant. The correct temperature is 280°C.

Dr. Lessing has drawn attention to the possibility of some portion of the dust present in the waste gases being natural dust deriving from the coal When an opportunity occurs we will make chemical analyses of dusts collected on a water gas plant to determine their compositions.

Mr. Coote describes some of the design faults and shortcomings as seen by plant operating engineers. These mainly involve the ancillary services which, at the design stage, generally receive less attention than do the principal features of the plant. Both designers and erectors will, it is hoped, take note of these important points.

The scheme outlined by Mr. Clark to produce electrical power by burning the tar produced on a water gas plant in a gas turbine and at the same time to produce preheated air for blowing is technically sound as it would apply to plants of the Beckton size. Moreover, the economics would appear to be attractive.

Improved Drying Chamber for Factory Moulds

—continued from p. 237.

gained by the foundry, other improvements resulted. Fuel cost was lowered by 10%, and a secondary drying of the moulds could be omitted. It was further found that a quantity of fuel could be saved by keeping the chamber closed after withdrawing the moulds. The firm is satisfied for the present with the altered chamber, but intends to construct in the future a furnace in which the combustion chamber is mounted below furnace floor. Otherwise the diagram in Fig. 2 will be followed. The difference between old and new is as follows:— Total weight of sand 25,000 kg. Evaporated water out of moisture contents of 2,500 kg in No. 1: 1,616 kg and in No. 2: 2,375 kg.

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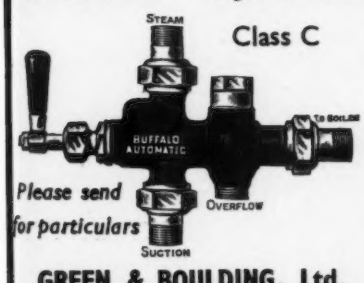

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J. C. INGRAM,
Secretary to the Board.

WEST MIDLANDS GAS BOARD

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WALES GAS BOARD

TECHNICAL HEADQUARTERS DRAUGHTSMAN

APPLICATIONS are invited for the position of DRAUGHTSMAN on the Technical Headquarters Staff at Morriston Works, Swansea.

Candidates should be experienced in the design and construction of steelwork and have had sound drawing office training. Experience of site surveying and the preparation of plans is necessary.

The salary offered for the appointment is in accordance with Grade A.P.T. 8A (£710/£790 per annum) of the National Salary Scale for Gas Staffs. The post is pensionable.

The successful candidate will be required to pass a medical examination.

DISTRIBUTION TRAINING OFFICER

APPLICATIONS are invited for the above post from persons suitably qualified.

The duties of the post cover the examination of distribution practice within the Board, including materials and methods and also with particular reference to gas fitting. The successful applicant will be required to lecture to distribution staff in the Board's area of supply on methods, materials and appliances.

The successful applicant will be required to undergo a medical examination.

The commencing salary will be within the range of A.P.T. 12A (£900/£1,025) according to qualifications and experience.

The post is pensionable.

Applications for the above appointments, stating age, qualifications, and experience, together with the names of two referees, should be addressed to the undersigned within fourteen days of the appearance of this advertisement.

C. B. MAWER,
Secretary.

Wales Gas Board,
2, Windsor Place,
Cardiff.

(*Classified advertisements continued on page* 254)

APPOINTMENTS VACANT (ctd.)

SOUTHERN GAS BOARD

ASSISTANT TO THE TRAINING AND EDUCATION OFFICER

APPLICATIONS are invited from suitably qualified persons for the new post of ASSISTANT to the Training and Education Officer. Applicants should have an interest in and a knowledge of Industrial Training and Education and should be able to discuss matters of common interest with Principals of educational establishments and with senior officials of the Board. The post will be based on Bournemouth.

The successful applicant will be required to develop contacts with schools and colleges and to lecture as required.

The starting salary will be within Grades A.P.T. 11-12 (£850-£1,025 per annum) or by arrangement with the successful applicant.

The successful candidate may be required to pass a medical examination and, unless already subject to a Pension Scheme by virtue of the Gas (Pension Rights) Regulations, 1950, will be required to join the Board's Staff Pension Scheme.

Applications, stating age, education, experience, and present appointment should be addressed to reach the Personnel Manager, Southern Gas Board, 164, Above Bar, Southampton, not later than February 16, 1957.

AN ENGINE FITTER is required by the SOUTHERN GAS BOARD at their Camberley Works, for machinery maintenance and overhaul. The rate will be in accordance with the agreement with the Confederation of Shipbuilding and Engineering Unions.

Applications should be addressed to the Regional Labour Officer, Oxford and Reading Region, Southern Gas Board, The Gas Works, Oxford, to arrive not later than February 15, 1957.

NATIONAL COAL BOARD

NORTH EASTERN DIVISION

APPLICATIONS are invited for the following vacancies in the Carbonisation Department.

(a) At Divisional Headquarters, Sheffield.

DESIGNER DRAUGHTSMEN.—Salary range £695/£815. Applicants must be capable of undertaking general engineering and plant layout work. A knowledge of chemical or gas plant would be an advantage.

(b) At Maltby Main Coking Plant, Wath-on-Dearne, near Rotherham.

DEPUTY PLANT MANAGER.—Salary range £875/£1,500. Applicants must have had a wide experience on a large modern Coking Plant with silica ovens, refining of benzole to pure products and the supply of purified gas to public undertakings.

MECHANICAL ENGINEER — Salary range £800/£1,175. Applicants must be capable of taking charge of maintenance on a large modern coke oven plant including electrical power station. Essential qualifications are:—

1. Sound mechanical training in workshops, and drawing office, embracing some training in structural and civil engineering.
2. A working knowledge of heat and corrosion resisting material.
3. A sound knowledge of the fundamental principles of applied physics and chemistry.
4. Experience in a responsible position appertaining to the maintenance of chemical plant and boiler plant.
5. A recognised qualification in Engineering is desirable.

Applications stating age, qualifications and experience and showing clearly for which post application is made, to Administrative Officer, N.C.B., N.E. Division, Carbonisation Department, Standfield House, Fulwood Road, Sheffield, 10, by February 11, 1957. Envelopes should be marked 'Staff Vacancy.'

NATIONAL COAL BOARD

EAST MIDLANDS DIVISION CARBONISATION DEPARTMENT

A VACANCY exists for a SCIENTIST Grade 2 (£925 x £35—£1,300) to take charge of the Avenue Carbonisation and Chemical Plant Laboratory which has a staff of 30 Chemists. Candidates should possess Hons. B.Sc. or A.R.I.C. or equivalent qualifications and should have had experience in Carbonisation and the testing of benzole and tar products.

Applications should be sent to the Administrative Officer, P.O. Box 16, Chesterfield, to arrive not later than February 23, 1957, and quoting C.S.V. 50.

NORTH EASTERN GAS BOARD

BRADFORD GROUP - THWAITES GASWORKS, KEIGHLEY CHIEF TECHNICAL ASSISTANT

APPLICATIONS are invited for the above position at a salary within Grade A.P.T. 11 (Provincial 'A') (£850-£975 per annum) of the Salary Scales agreed by the National Joint Council for Gas Staffs.

Applicants must have had experience in the operation and control of gas production and ancillary plant including Continuous Vertical Retorts and Carburetted Water Gas Plant. Applicants should also possess suitable academic qualifications and be Corporate Members of the Institution of Gas Engineers. Experience in the control of Works personnel would be an advantage.

The successful applicant will be required to pass a medical examination and to join the Board's Staff Pension Scheme.

Applications setting out details of education, training and experience, should reach C. A. Newham, Esq., Group General Manager, North Eastern Gas Board, Bradford Group, Britannia House, Bradford, by February 18, 1957.

J. C. GARDNER,
Secretary.

COLONIAL GAS HOLDINGS LIMITED MELBOURNE, AUSTRALIA

APPLICATIONS are called for the following appointments:—

MANAGER

Manager of a Melbourne suburban gas undertaking with an annual output of approximately 1,200 million cubic feet of 500 B.T.U. gas manufactured in Glover West continuous vertical retorts.

Duties.—To be responsible under the direction of the General Manager, for the control of the Works and District of the undertaking.

Salary. — £2,000-£2,500 Australian currency, depending upon experience and qualifications.

A car will be provided for use on company's business.

WORKS SUPERINTENDENT FOR SAME UNDERTAKING

Duties.—Under the direction of the Manager, to be responsible for all gasworks' operations.

Salary. — £1,700-£1,800 Australian currency, depending upon experience and qualifications.

In each case, the company will pay one-class steamer fares (P. & O. or Orient Line) to Melbourne for appointee and his family, and also transport personal effects. Salary will commence from date of embarkation. If required, assistance will be given with securing of suitable housing in Melbourne.

Applications should be submitted by March 4, addressed to The Colonial Gas Association Ltd., care William Coward & Co. Ltd., 3, St James's Square, London, S.W.1.

SENIOR DRAUGHTSMAN for old-established Company, must be experienced in planning layout of gasworks and chemical plant, amenities include the provision of a modern house, subsidised canteen meals, and a generous non-contributory pension scheme. Attractive salary paid to suitable applicant. Only experienced draughtsmen with minimum qualifications of H.N.C., and of 30 years of age or over need apply. Applications with full particulars of experience to C. & W. Walker Ltd., Midland Ironworks, Donnington, Wellington, Shropshire.

CONTRACTS MANAGER (Executive status) required for Gasholder and Gas Plant Division of well-known Midland Company of Constructional Engineers. Applicants must have had considerable experience in design and estimating for Gasholders and General Platework. Substantial salary will be paid for the right man. Pension scheme, usual Canteen facilities, five day week. Applications giving age, personal particulars, qualifications and experience should be addressed marked "Personal" to Managing Director, No. 310, *Gas Journal*, 11 Bolt Court, Fleet Street, London, E.C.4.

All applications will be treated strictly in confidence.

NORTH WESTERN GAS BOARD

SOUTH LANCASHIRE GROUP CHEMISTS

APPLICATIONS are invited for the above two pensionable appointments at St. Helens at salaries within Grades A.P.T. 7/8 (£670/£790 p.a.).

Applicants should have a good knowledge of chemistry relating to gasworks or other fuel industry practice and possess a Higher Grade Certificate in chemistry or an equivalent qualification. Gasworks experience would be an advantage.

Detailed applications, giving the names of two referees, should reach the General Manager, N.W.G.B., South Lancashire Group, Radiant House, Cotham Street, St. Helens, within 14 days.

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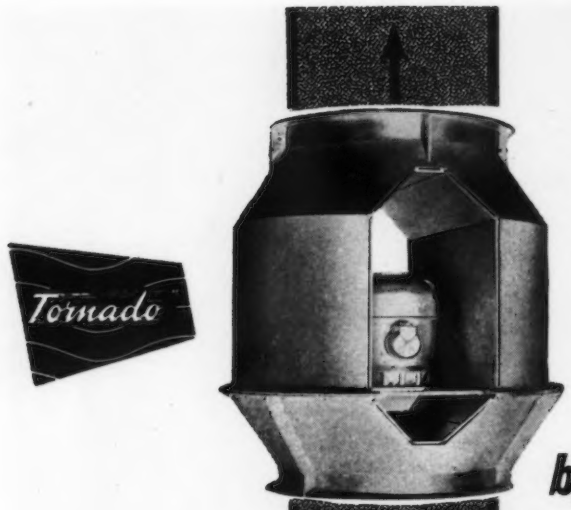

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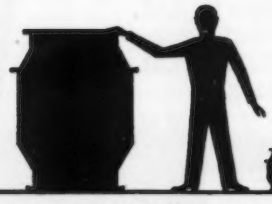

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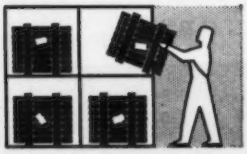

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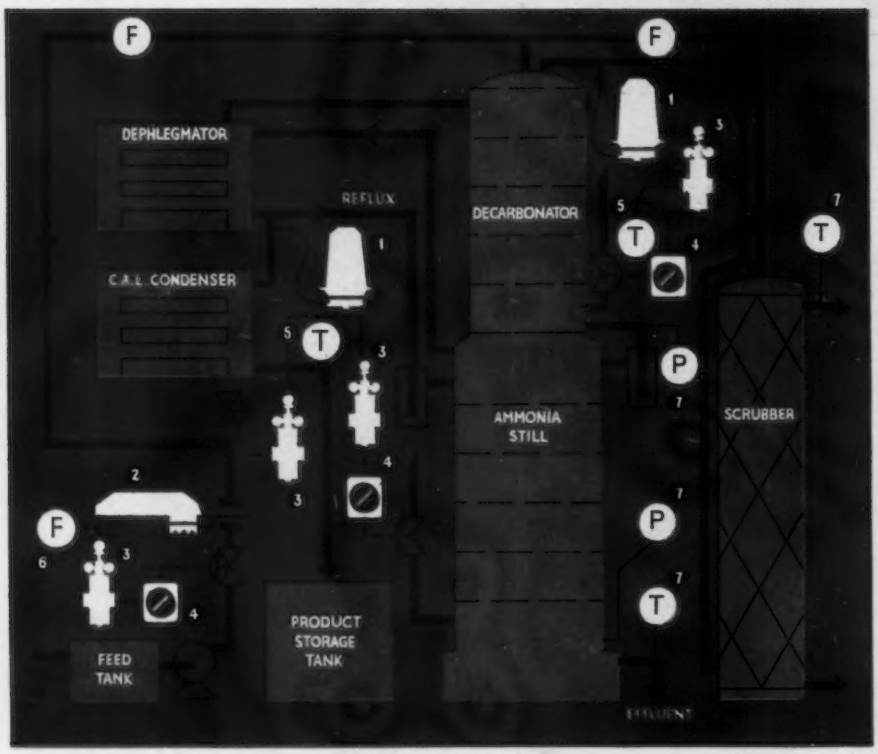

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